

PRE-CONSTRUCTION REMEDIAL ACTION SCOPE OF WORK FOR THE CAPTAINS COVE SITE

SUBMITTED TO:



New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A, Section C
625 Broadway
Albany, New York 12233



United States Environmental Protection Agency
Region 2
290 Broadway, 20th Floor
New York, New York 10007

PREPARED FOR:

RXR-Glen Isle Partners, LLC
625 RXR Plaza
Uniondale, New York 11556

PREPARED BY:



P.W. Grosser Consulting, Inc.
630 Johnson Avenue, Suite 7
Bohemia, New York 11716
Phone: 631-589-6353
Fax: 631-589-8705

James P. Rhodes, Senior Vice President
Derek Ersbak, Project Manager

jimr@pwgrosser.com
dereke@pwgrosser.com

PWGC Project Number: RGI1504

P.W. GROSSER CONSULTING INC.
PROJECT No. RGI1504

PRE-CONSTRUCTION REMEDIAL ACTION SCOPE OF WORK FOR THE CAPTAINS COVE SITE

GARVIES POINT WATERFRONT REVITALIZATION PROJECT
GELN COVE, NEW YORK

SUBMITTED:
March 2016

PREPARED FOR:

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A, Section C
625 Broadway
Albany, New York 12233

United States Environmental Protection Agency
Region 2
290 Broadway, 20th Floor
New York, New York 10007

ON BEHALF OF:

RXR-Glen Isle Partners, LLC
625 RXR Plaza
Uniondale, New York 11556

PREPARED BY:

P.W. Grosser Consulting, Inc.
630 Johnson Avenue, Suite 7
Bohemia, New York 11716

**PRE-CONSTRUCTION REMEDIAL ACTION SCOPE OF WORK
CAPTAINS COVE SITE
GLEN COVE, NEW YORK**

TABLE OF CONTENTS		PAGE
1.0	INTRODUCTION	1
1.1	Project Background	1
1.2	Remedial Action Removal Criteria	1
1.3	Evaluation of Current Site Conditions	2
2.0	DESCRIPTION OF PROPOSED REMEDIAL ACTION	3
2.1	Summary of Remedial Action	3
2.1.1	Captains Cove Site	3
3.0	REMEDIAL ACTION ACTIVITIES	5
3.1	Governing Documents	5
3.1.1	Site-Specific Health and Safety Plan	5
3.1.2	Quality Assurance Project Plan	5
3.1.3	Community Air Monitoring Plan	5
3.1.4	Radiation Monitoring Plan	6
3.1.5	Decontamination Plan	6
3.2	Soil Excavation and Removal	6
3.2.1	Excavation Techniques	6
3.3	Post Excavation Survey	7
3.4	Site Backfill/Restoration	7
3.5	Remedial Monitoring	7
3.5.1	Construction Phase Monitoring	8
3.5.2	Post-Excavation Monitoring and Verification	8
3.5.3	Waste Characterization	9
4.0	REMEDIAL EXCAVATION PROCEDURES	10
4.1	Notifications	10
4.2	Mobilization	10
4.3	Site Security	10
4.4	Pre-Excavation Utility Locating	10
4.5	Soil Stockpile Area Construction and Maintenance	11
4.6	Soil Disposal	11
4.7	Backfill and Site Restoration	11
4.8	Dust Suppression	11
4.9	Odor Control	12
4.10	Sediment and Erosion Control	12
4.11	Demobilization	12
5.0	REMEDIAL ACTION MANAGEMENT	13
5.1	Project Organization and Oversight	13
5.2	Reporting and Record Keeping	13
5.2.1	Daily Reports	13
5.2.2	Record Keeping and Photo Documentation	13
5.3	Deviations from the Remedial Action Scope of Work	14
6.0	CONSTRUCTION COMPLETION REPORT	15
7.0	SCHEDULE	16

FIGURES

FIGURE 1	VICINITY MAP
FIGURE 2	SITE PLAN
FIGURE 3	REMEDIAL EXCAVATION PLAN

TABLES

TABLE 1	EXCAVATION SUMMARY TABLES
TABLE 2	REMEDIATION AREA SUMMARY TABLES – METALS

APPENDICES

APPENDIX A	HEALTH AND SAFETY PLAN
APPENDIX B	QUALITY ASSURANCE PROJECT PLAN
APPENDIX C	COMMUNITY AIR MONITORING PLAN
APPENDIX D	RADIATION MONITORING PLAN
APPENDIX E	DECONTAMINATION PLAN

ACRONYM

ACRONYM	DEFINITION
ASP	Analytical Services Protocol
CAMP	Community Air Monitoring Plan
CCR	Construction Completion Report
CFR	Code of Federal Regulations
DER	Division of Environmental Remediation
DER-10	Technical Guidance for Site Investigation & Remediation
EC/IC	Engineering Control / Institutional Control
ELAP	Environmental Laboratory Accreditation Program
GCIDA	Glen Cove Industrial Development Agency
GPS	Global Positioning System
HASP	Health and Safety Plan
HSM	Health & Safety Manager
MARSSIM	Multi-Agency Radiation Survey & Site Investigation Manual
NAD 83	North American Datum of 1983
NGVD 29	National Geodetic Vertical Datum of 1929
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety & Health Administration
PCB	Polychlorinated Biphenyls
PE	Professional Engineer
PID	Photo-ionization Detector
PM	Project Manager
PWGC	P.W. Grosser Consulting, Inc.
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance / Quality Control
RMP	Radiation Monitoring Plan
SEC	Safety and Ecology Corporation
SMP	Site Management Plan

SOW	Scope of Work
SSRC	Site-Specific Removal Criteria
SVOC	Semi-Volatile Organic Compound
TAGM	Technical and Administrative Guidance Memorandum
USC&G	U.S. Coast & Geodetic Survey
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
GPWRP	Garvies Point Waterfront Revitalization Project
XRF	X-Ray Fluorescence

CERTIFICATION

I, Paul K. Boyce, certify that I am currently a New York State registered professional engineer (PE), as defined in Title 6 New York Codes, Rules, & Regulations (NYCRR) Part 375, and that this Pre-Construction Remedial Action Scope of Work (SOW) was prepared in accordance with applicable statutes and regulations and in substantial conformance with the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10).

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

PAUL K. BOYCE

PE Name

03.22.16

Date

Paul Boyce

Signature

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.



1.0 INTRODUCTION

P.W. Grosser Consulting, Inc. (PWGC) has prepared the following Pre-Construction Remedial Action Scope of Work (SOW) for the Captains Cove Site (the Site) in support of the Garvies Point Waterfront Revitalization Project (GPWRP). The Site is currently owned by the Glen Cove Industrial Development Agency (GCIDA). The purpose of this SOW is to detail the procedures for proposed remedial actions to be completed by RXR Glen-Isle Partners, LLC, in partnership with GCIDA in order to allow for the re-use of the property for restricted-residential purposes.

The SOW has been prepared in accordance with the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10) and the Site Management Plan for Captains Cove Site, Glen Cove, NY (Dvirka and Bartilucci, June 2010). The Site Management Plan (SMP) provides additional background information, a Site description and soil management specifications for the Site.

1.1 Project Background

The Site is located along Garvies Point Road in Glen Cove, New York. Redevelopment associated with the GPWRP will include restricted-residential, commercial and retail space, as well as open space and public amenities. A Vicinity Map is included as **Figure 1**; a Site Plan is included as **Figure 2**. Please note that the Site, as defined in this work plan, does not include the eastern extent of the property. This portion of the Site has been remediated and is currently being utilized by the City for Ferry Terminal operations.

1.2 Remedial Action Removal Criteria

The Proposed Amended Record of Decision (ROD) and the Proposed Remedial Action Plan publically noticed by the NYSDEC in March 2016 included requirements for the excavation and off-site disposal of isolated pockets of residual soil contamination as delineated by the Pre-Construction Investigation Report dated March 2016 containing contaminants concentrations above the following site specific removal criteria:

- | | |
|------------------------------------|---|
| 1. Arsenic | 175 mg/kg |
| 2. Lead | 660 mg/kg |
| 3. Radium-226 | > 5 pCi/g* |
| 4. Thorium-232 | > 5 pCi/g* |
| 5. Grossly Contaminated Media | As defined in 6 NYCRR Part 375-1.2(u)** |
| 6. Non-Aqueous Phase Liquid (NAPL) | As defined in 6 NYCRR Part 375-1.2(ac)*** |

* Not including the natural background radiation of nuclide of approximately 1 pCi/g

**** Grossly Contaminated media** means soil, sediment, surface water or groundwater which contains sources or substantial quantities of mobile contamination in the form of NAPL, as defined in subdivision 375-1.2 (ac), that is identifiable either visually, through strong odor, by elevated contaminant vapor levels or is otherwise readily detectable without laboratory analysis.

***** NAPL** means a contaminant that is a liquid which may be denser or lighter than water and does not mix easily or dissolve in water, but remains as a separate phase.

1.3 Evaluation of Current Site Conditions

The following narrative is intended to summarize current environmental conditions at the Site in comparison to the SSRCs referenced above, with the goal of identifying removal actions necessary to address constituent exceedances in order to allow for the redevelopment of the Site for restricted-residential purposes. In doing so, analytical data from the following historical investigation reports was utilized for this purpose:

- Roux Associates, Inc., Final Remedial Investigation Report, January 1999;
- Metron Development Services, Glen Isle Field Verification Program Certification Sampling Event #1, May 2004;
- PWGC, Pre-Construction Confirmatory/Insurance Data Gap Subsurface Investigation Report, May 2014;
- Gannett Fleming Engineers, P.C., Draft Contaminated Material Assessment Report, January 2015;
- PWGC, Leachable Arsenic and Lead Sampling Report, February 2015;
- PWGC, Pre-Construction Confirmatory/Insurance Data Gap Subsurface Investigation Report Addendum 1, February 2016; and,
- PWGC, Synthetic Precipitation Leaching Procedure Investigation/Red Flag Area Characterization Report, February 2016.

The findings of historical investigations have shown concentrations of arsenic, lead, and grossly contaminated media in excess of respective SSRC at varying locations and depths throughout the Site.

2.0 DESCRIPTION OF PROPOSED REMEDIAL ACTION

The goal of this remedial program is to remove contaminated materials identified at the Site in excess of SSRC to facilitate the redevelopment of the Site for restricted-residential purposes. Remedial measures described herein will be performed in accordance with DER-10, applicable laws and regulations, the SMP and this SOW. This remedy is protective of public health and/or the environment for the intended use.

2.1 Summary of Remedial Action

PWGC has prepared this SOW to remediate areas that have been identified to contain contamination at levels in excess of SSRC based on the findings of the historical environmental investigations completed at the Site. The proposed remedial action is effective in both the short-term and long-term, reduces mobility, toxicity and volume of contaminants and uses standard methods that are well established in the industry. Below is a summary of proposed remedial excavation areas to be performed as part of this SOW. Refer to **Figure 3** for a remedial excavation plan depicting proposed remedial excavation areas. Refer to **Table 1** for proposed excavation sizes and depths. Refer to **Table 2** for analytical summaries depicting results of prior investigations performed within the proposed excavation areas exhibiting constituents in exceedance of SSRC.

2.1.1 Captains Cove Site

As illustrated on **Figure 3**, remedial excavation activities will be completed to encompass the following sample locations that contain constituents in exceedance of SSRC or where grossly contaminated media was identified at the Site:

- CC-C-004 (Lead)
- CC-C-008 (Lead)
- CC-C-017 (Arsenic)
- CC-C-019 (Arsenic & Lead)
- CC-C-022 (Arsenic)
- CC-C-023 (Lead)
- CC-C-028 (Arsenic & Lead)
- CC-C-029 (Lead)
- CC-C-030 (Lead)
- CC-C-048 (Lead)
- CC-C-051 (Grossly Contaminated Media)
- CC-GI-006 (Lead)
- CC-GI-007 (Lead)

- D2 (Grossly Contaminated Media)

The proposed remedial excavation activities identified above will be performed in accordance with DER-10 guidance, as well as the SMP and this SOW, and at a minimum shall include the following:

1. Implementation of a community air monitoring program for particulates and volatile organic vapors;
2. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking and staking of excavations;
3. Excavation of materials exceeding SSRC. Screening of excavated materials shall be performed during intrusive work for indications of contamination by visual means, odor, and monitoring with a photo-ionization detector (PID) and radiological count-rate meter and scaler;
4. Collection and analysis of confirmatory samples to confirm that material exceeding SSRC has been removed;
5. Placement of backfill materials in compliance with this SOW, SMP requirements and in accordance with applicable laws and regulations;
6. Characterization, transport and off-site disposal of excavated materials at permitted disposal facilities in accordance with this SOW, SMP requirements and applicable laws and regulations for handling, transport, and disposal of contaminated materials; and,
7. Submission of a Construction Completion Report (CCR) that describes remedial activities performed, certifying that remedial requirements have been achieved and documenting any changes from this SOW.

3.0 REMEDIAL ACTION ACTIVITIES

The proposed remedial action activities to be performed are detailed in the following sections and are in conformance with the SMP, unless otherwise stated.

3.1 Governing Documents

3.1.1 Site-Specific Health and Safety Plan

The site-specific Health and Safety Plan (HASP) takes into account the specific hazards inherent to the GPWRP and presents the minimum requirements which are to be met by the remediation contractor and its subcontractors, PWGC and its subcontractors, and other on-site personnel in order to avoid and, if necessary, protect against health and/or safety hazards. The site-specific HASP is included as **Appendix A**.

Contractors and subcontractors will have the option of adopting this HASP or developing their own site-specific document. If a contractor or subcontractor chooses to prepare their own HASP, it must meet the minimum requirements as detailed in the site-specific HASP prepared by PWGC and must be made available to PWGC, NYSDEC, USEPA, and NYSDOH, for review and approval prior to mobilization to the Site.

Activities performed under the HASP will comply with applicable parts of the Occupation Safety and Health Administration (OSHA) Regulations, primarily 29 Code of Federal Regulations (CFR) Parts 1910 and 1926, and the PWGC Corporate Environmental Health and Safety policy. Modifications to the HASP may be made with the approval of the PWGC Health and Safety Manager (HSM) and/or Project Manager (PM) and will require subsequent approval by the agencies prior to implementation.

3.1.2 Quality Assurance Project Plan

The quality assurance project plan (QAPP), included as **Appendix B**, presents the objectives, functional activities, methods, and quality assurance/quality control (QA/QC) requirements associated with sample collection and laboratory analysis for remedial activities. The QAPP follows requirements detailed in the Uniform Federal Policy for Quality Assurance Project Plans.

3.1.3 Community Air Monitoring Plan

A site-specific Community Air Monitoring Plan (CAMP) has been prepared and is included as **Appendix C** to provide measures for protection of on-site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the remedial work) from potential airborne contaminants as a direct result of the remedial activities. The primary concerns for this remedial work are VOCs and dust particulates.

The CAMP was prepared and will be implemented and executed in accordance with 29 CFR 1910.120(h), the

NYSDOH Generic CAMP, and NYSDEC Technical and Administrative Guidance Memorandum (TAGM) #4031.

3.1.4 Radiation Monitoring Plan

A site-specific Radiation Monitoring Plan (RMP) has been prepared in accordance with the Multi-Agency Radiation Survey and Site Investigation Manual, Revision 1 (USEPA, August 2000 and June 2001 updates) (MARSSIM) and is included as **Appendix D** to provide measures for radiation monitoring activities to be performed during remedial activities.

3.1.5 Decontamination Plan

A site-specific Decontamination Plan has been prepared and is included as **Appendix E** to detail general and specific procedures, methods, and considerations to be utilized and observed with regard to decontamination procedures during the course of the remedial action.

3.2 Soil Excavation and Removal

As described in aforementioned sections, the purpose of this SOW is to detail the procedures for proposed remedial excavations to be completed in order to allow for the re-use of the property for restricted-residential purposes. The following is intended to describe the overall remedial excavation activities to be performed, as well as respective monitoring to be implemented during the performance of the work.

3.2.1 Excavation Techniques

Each excavation area will be surveyed or located with global positioning system (GPS) prior to any excavation work. Each excavation will start with an area five feet wide by five feet long centered on the historical sampling location, with the exception of sample locations CC-C-030 and CC-C-051 which will start as areas fifteen feet wide by fifteen feet long centered on the historical sampling location.

Soil excavation and removal will be performed in accordance with Section 4.0 of this SOW. Soil will be excavated from the excavation area utilizing an excavator/backhoe or equivalent. Excavations shall be performed in a manner that will prevent spills/spread of contamination. Excavation shall also be accomplished by methods which preserve the undisturbed state of subsurface soil whenever possible.

Excavated soil will be stockpiled on polyethylene sheeting and subsequently characterized for off-site disposal in accordance with the requirements of DER-10, as well as SMP requirements. It should be noted that, to the extent practical, overlying soils (above the depth interval requiring remedial excavation consistent with SSRC) will be segregated and stockpiled separately for potential re-use on-site. Sampling of overlying soils will be performed consistent with Section 4.7 of this SOW for Agency review and approval prior to on-site reuse.

Upon successful completion of excavation activities, confirmatory samples will be collected from the sides and bottom of each excavation area. Once the final extent of each excavation is demonstrated, as determined by the results of confirmatory samples collected and subsequently approved by the agencies, a demarcation layer will be installed and the excavations will be backfilled with soil meeting the requirements of Section 4.7 of this SOW. This procedure will continue until the confirmatory samples show that each area was remediated to SSRC or until the water table is reached.

During the performance of excavation activities, each two-foot lift will be characterized and screened for the following:

- Visual signs of staining or discoloration;
- Volatile organic vapors utilizing a PID; and,
- Radiation screening utilizing a radiation rate meter/scale in accordance the RMP (**Appendix D**)
 - Soils with readings above two times established background will be segregated separately from other soils and tested prior to off-site disposal.

Handheld X-ray fluorescence (XRF) spectrometer monitoring of soil for heavy metals will not be performed as detailed in the SMP. The handheld XRF spectrometer has shown insufficient accuracy to make decisions in the field.

3.3 Post Excavation Survey

A surveyor licensed in the State of New York shall survey the final horizontal and vertical extents of each excavation and the location of confirmatory samples. Horizontal locations surveyed shall be in U.S. feet relative to the New York State Plane Coordinate System, Long Island Zone, North American Datum of 1983 (NAD 83). Elevations surveyed shall be in U.S. feet relative to the National Geodetic Vertical Datum of 1929 (NGVD 29). The NGVD Datum is also known as the U.S. Coast and Geodetic Survey (USC&G) Mean Sea Level Datum of 1929.

3.4 Site Backfill/Restoration

Backfill meeting the requirements of Section 4.7 of this SOW, consisting of imported fill material or overlying soils approved for on-site reuse will be utilized to backfill open excavation areas. Each excavation area will be backfilled after agency approval of the confirmatory sample results. A demarcation layer will be installed at the remediated depth prior to the addition of any backfill material.

3.5 Remedial Monitoring

The following remedial monitoring was developed in accordance with the SMP and will be implemented during

the performance of the work.

3.5.1 Construction Phase Monitoring

Monitoring during soil excavation will be performed to protect the health of Site workers and the surrounding community. A RMP, HASP and CAMP have been developed for this project and are included as appendices to this SOW. These plans specify the monitoring procedures, action levels, and contingency measures that are required to protect public health and on-site workers. Generally, air monitoring will include real-time measurement of volatile emissions, radiological monitoring of excavated soils and fugitive dust levels. The project HASP is included as **Appendix A**, the CAMP is included as **Appendix C**, and the RMP is included as **Appendix D**.

3.5.2 Post-Excavation Monitoring and Verification

Following removal of impacted soils, confirmatory soil samples will be collected from each excavation area to confirm the effectiveness of remedial activities. Confirmatory soil samples will be collected in accordance with NYSDEC DER-10.

As specified in NYSDEC DER-10, verification sampling will consist of collecting confirmatory soil samples from within each excavation area. DER-10 specifies a sampling frequency of one bottom sample from each excavation for every 900 square feet of bottom, and one sidewall sample for every 30 linear feet of sidewall. A minimum of four sidewall samples and one bottom sample will be collected from each excavation area. Should the excavation expand, additional sidewall and bottom samples will be collected at the frequency specified above.

Confirmatory soil samples will be analyzed for the suite of constituents identified at each excavation as specified below:

- Metals remediation areas will be analyzed for arsenic and lead by USEPA Method 6010; and,
- Grossly contaminated media areas and any areas exceeding PID action levels will be analyzed for Volatile Organic Compounds (VOCs) by USEPA Method 8260 and Semi-volatile Organic Compounds (SVOCs) by USEPA Method 8270, in addition to arsenic and lead by USEPA Method 6010; and,
- If any areas exceed radiological action levels they will also be analyzed for radium-226 and thorium-232 by Method A-01-R-Isotopic Thorium (Alpha Spectrometry) and Method GA-01-R-Radium-226 & Other Gamma Emitters, as applicable.

Samples collected for volatile organic analysis will be collected utilizing tera-core sampling devices. The

remaining sample volume will be transferred to a stainless steel bowl and homogenized. Once homogenized, samples will be transferred to laboratory supplied glassware, packed in a cooler with ice and shipped under proper chain-of-custody procedures to a NYSDOH Environmental Laboratory Accreditation Program (ELAP) certified laboratory for analysis in accordance with NYSDEC Analytical Services Protocol (ASP) Category B Data Deliverable packages and Electronic Data Deliverables (EDDs, in EQUIS format) will be furnished by the laboratory. Sampling equipment decontamination will be performed in accordance with the project QAPP included as **Appendix B**.

3.5.3 Waste Characterization

Waste characterization will be performed by collecting representative soil samples from excavated soil stockpiles. Sample analysis will be as specified by the requirements of the prospective disposal facility's waste acceptance criteria. After the results of the analysis are complete, the remediation contractor will prepare the necessary forms for submittal to the waste disposal/treatment facility. The forms will then be submitted to the waste disposal facility for evaluation and final approval. Sampling equipment decontamination will be performed in accordance with the project QAPP included as **Appendix B**.

A letter of commitment stating that the disposal facility is permitted to accept and has the available capacity to receive the waste that will be shipped from the Site along with the disposal facility and transporter permits and waste characterization results will be submitted to the Agencies for final approval prior to disposal.

4.0 REMEDIAL EXCAVATION PROCEDURES

The following is intended to describe procedures and protocols to be implemented during the performance of remedial excavation activities.

4.1 Notifications

At least 10 days prior to the start of any activity contemplated as part of this SOW, the Site owner or their representative will notify the Agencies. Currently, this notification will be made to:

Heidi-Marie Dudek, P.E.
Regional Hazardous Waste Remediation Engineer
NYSDEC
DER
625 Broadway
Albany, NY 12233-7015

and

Lorenzo Thantu
USEPA
Region 2
290 Broadway, 20th Floor
New York, New York 10007

4.2 Mobilization

Mobilization will include the delivery of construction equipment and materials to the Site. Site workers will receive Site orientation and training in accordance with the SMP, RMP, HASP, and CAMP and established policies and procedures to be followed during the implementation of the remedial action. The remediation contractor and associated subcontractors will each receive a copy of the SMP, SOW, RMP, HASP and CAMP and will be briefed on their contents.

4.3 Site Security

Site security will be maintained by utilizing temporary construction fences to be set up as needed. The temporary construction fencing will be maintained throughout the project and access gates will be kept closed during daily operations and closed and locked at all other times.

4.4 Pre-Excavation Utility Locating

A pre-excavation utility location survey will be performed prior to the start of work. The contractor will review available utility maps and locate utilities in the area of excavations. In addition, the One Call Center (1-800-272-4480) will be contacted prior to initiating excavation activities.

4.5 Soil Stockpile Area Construction and Maintenance

Prior to performing excavations, soil staging areas will be setup on-site. Each staging area will be setup as detailed below.

- A double layer of ten (10) mil thick sheeting shall be placed beneath stockpiled material to prevent contact with undisturbed or clean soil;
- A single layer of ten (10) mil thick sheeting shall be used to cover the top of stockpiles;
- Individual stockpiles shall not exceed a volume of 500 cubic yards;
- Stockpiles shall be constructed to isolate the stockpiled material from the environment; and,
- Diversion measures will be employed to prevent storm water run-on and run-off to the stockpiles.

4.6 Soil Disposal

Excavated soils will be sampled in accordance with the procedures described under Section 3.5.3 of this document to meet the waste acceptance criteria of the disposal facility. Impacted soil to be removed from the Site will be loaded into roll-off containers and/or dump trucks provided by a licensed waste transport company. Loading will be performed with a backhoe, excavator, or equivalent. Loaded containers will be covered with a tarp.

4.7 Backfill and Site Restoration

Following removal of impacted soils, a demarcation layer will be installed and excavated areas will be backfilled with imported clean fill meeting 6 NYCRR Part 375-6.7(d) or excavated material approved for reuse on-site. Prior to the import of any backfill materials to the Site, the results of chemical testing in accordance with DER-10 will be submitted to the Agencies for approval. Prior to the re-use of any excavated materials on-site, the results of chemical testing in accordance with DER-10 will be submitted to the Agencies for approval. Chemical testing for on-site re-use will consist of analysis for arsenic and lead by USEPA Methods 6010 and the results will be compared to the respective SSRC for each constituent.

4.8 Dust Suppression

If dust generation approaches action levels, suppression will be accomplished by:

- Covering/capping exposed soil area with mulch, rubber mats, etc.;
- Wetting equipment and excavation faces;
- Water spray dust suppression;
- Hauling materials in properly covered containers; and,
- Restricting vehicle speeds to 10 mph.

When possible, impacted soils will be loaded directly into trucks for immediate off-site disposal.

4.9 Odor Control

In the event that odor suppression becomes necessary, techniques to be implemented for control of odors from stockpiled soil or from the open excavation will include one or more of the following:

- Cover with plastic;
- Cover with “clean soil”;
- Application of hydro-mulch material*; and,
- Limit working hours to favorable wind and temperature conditions.

*This material is a seedless version of the hydro-seed product commonly used by commercial landscaping contractors to provide stabilization and rapid grow-in of grasses or wild flowers along highways, embankments and other large areas. Hydro-mulch can be sprayed over open excavation areas, temporary stockpile areas and loaded trucks, as necessary. This is a highly effective method for controlling odors, because the release of odors is sealed immediately at the source.

4.10 Sediment and Erosion Control

Erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff will be placed to protect the excavation work and adjacent areas during excavation activities. Storm water control measures, such as hay bales or silt fence, will be utilized during excavation activities to prevent storm water runoff from impacting excavation areas and soil stockpiles.

Hay bales and/or silt fence may be placed at locations up gradient of excavation areas to minimize water flow and soil from entering excavations, and down gradient of excavation areas, where possible, to prevent migration of soil from the excavations to other areas of the Site.

4.11 Demobilization

Following the completion of pre-construction remedial activities at the Site, equipment will be dismantled and removed from the Site. Prior to leaving the Site, personnel, equipment and vehicles will be decontaminated following the procedures established in PWGC’s Decontamination Plan (**Appendix E**). Solid wastes generated during remedial activities (i.e., polyethylene sheeting) will be properly disposed of as investigative derived waste.

5.0 REMEDIAL ACTION MANAGEMENT

5.1 Project Organization and Oversight

Principal personnel who will participate in the remedial action include Paul K. Boyce, P.E. and James P. Rhodes, C.P.G. The PE for this project is Paul K. Boyce, P.E. Derek Ersbak will be the remedial action PM and Amanda Racaniello will be the remedial action Field Team Leader.

Safety and Ecology Corporation (SEC) has been providing radiological expertise/monitoring for the GPWRP and will be responsible for implementation of the RMP. SEC is licensed by the commonwealth of Kentucky and has obtained reciprocity with the State of New York.

5.2 Reporting and Record Keeping

5.2.1 Daily Reports

Daily reports providing a general summary of activities for each day of active remedial work will be uploaded to an online database by the end of the following day. Those reports will include:

- Project number, statement of the activities, an update of progress made and locations of work performed;
- Quantities of material imported and exported from the Site;
- Status of on-site soil/fill stockpiles;
- A summary of all citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP exceedances, if any; and,
- Photograph of notable Site conditions and activities.

Daily reports are not intended to be the primary mode of communication for notification of emergencies (accidents, spills), requests for changes to the SOW or other sensitive or time critical information. However, such information will be included in the daily reports. Emergency conditions and changes to the SOW will be communicated directly to the Agencies by personal communication. Daily reports will be included as an Appendix in the CCR.

5.2.2 Record Keeping and Photo Documentation

Job-site record keeping for remedial work will be performed. These records will be maintained on-site during the project and will be available for inspection by the Agencies. Representative photographs will be taken of the Site prior to any remedial activities and during major remedial activities to illustrate remedial program elements and contaminant source areas. Photographs will be submitted at the completion of the project in the CCR in digital format (i.e. jpeg files).

5.3 Deviations from the Remedial Action Scope of Work

Changes to the SOW will be reported to the Agencies, will be documented in daily reports and reported in the CCR. The process to be followed if there are any deviations from the SOW will include a request for approval for the change from the Agencies noting the following:

- Reasons for deviating from the approved SOW;
- Effect of the deviations on overall remedy; and,
- Determination that the remedial action with the deviation(s) is protective of public health and the environment.

6.0 CONSTRUCTION COMPLETION REPORT

A CCR will be submitted to the Agencies following implementation of the remedial action defined in this SOW. The CCR will document that the remedial work required under this SOW has been completed and has been performed in compliance with this SOW. The CCR will include:

- Information required by this SOW;
- As-built drawings for constructed remedial elements, required certifications, manifests and other written and photographic documentation of remedial work performed under this remedy;
- Description of changes in the remedial action from the elements provided in this SOW;
- Tabular summaries of confirmatory sampling results and material characterization results, QA/QC results for confirmatory sampling, and other sampling and chemical analysis performed as part of the remedial action;
- Account of the locations and characteristics of contaminated material removed from the Site including a figure showing removal areas; and,
- Account of the disposal destination of contaminated material removed from the Site. Documentation associated with disposal of material will include transportation and disposal records, and letters approving receipt of the material.

Reports and supporting material will be submitted in digital form.

7.0 SCHEDULE

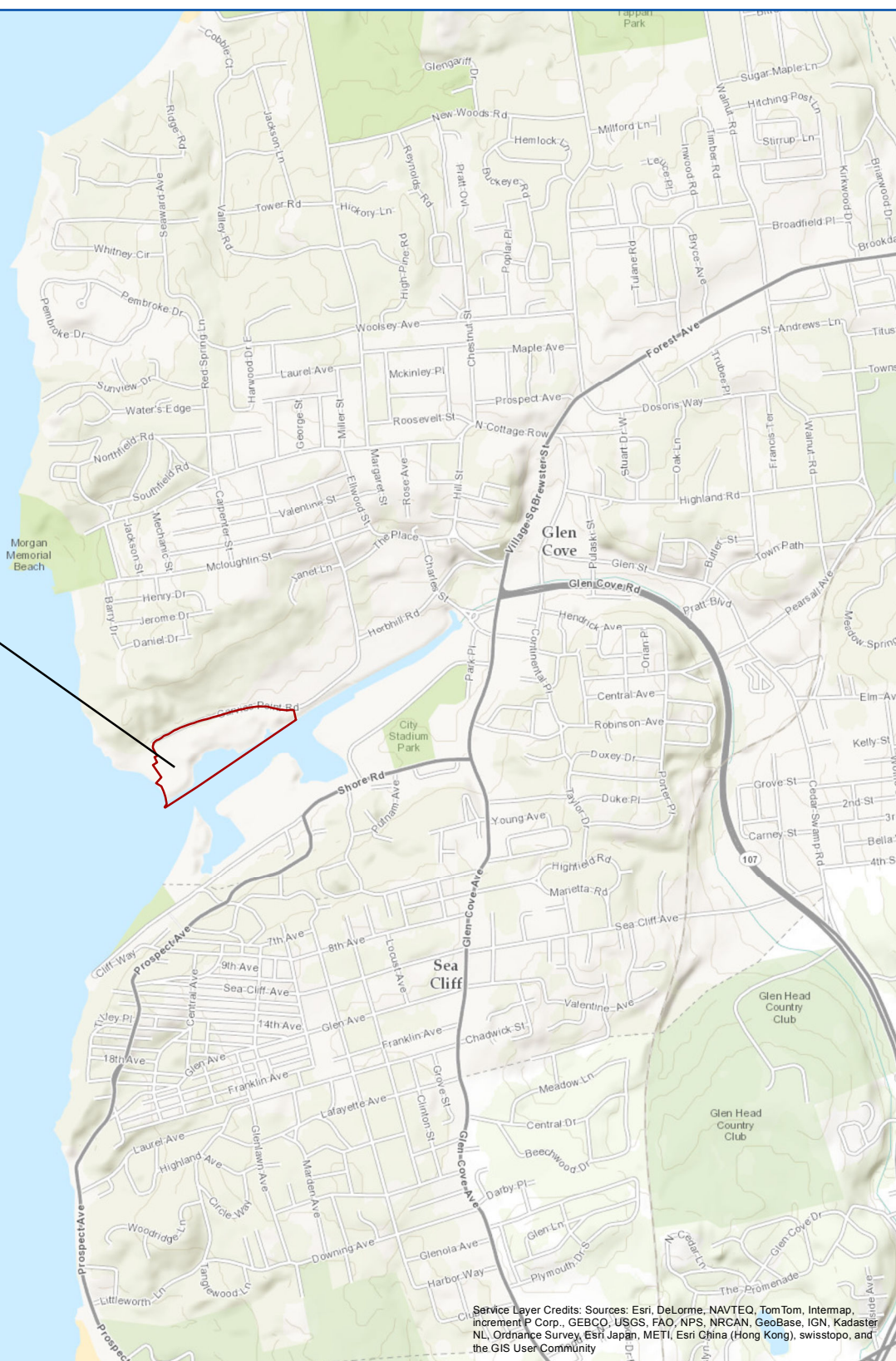
The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation activities changes, it will be updated and submitted to the Agencies. Currently, a seven-week remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
Approval of SOW	0	1
Mobilization	1	0
Remedial Implementation	2	4
Demobilization	6	0
Submit CCR	7	1

FIGURES



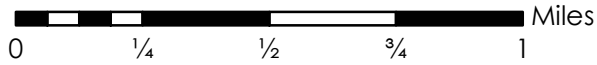
SUBJECT SITE



Service Layer Credits: Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

SUBJECT SITE VICINITY

GARVIES POINT ROAD
GLEN COVE, NY

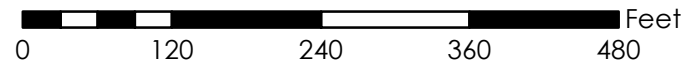


PWGC
Strategic Environmental and Engineering Solutions

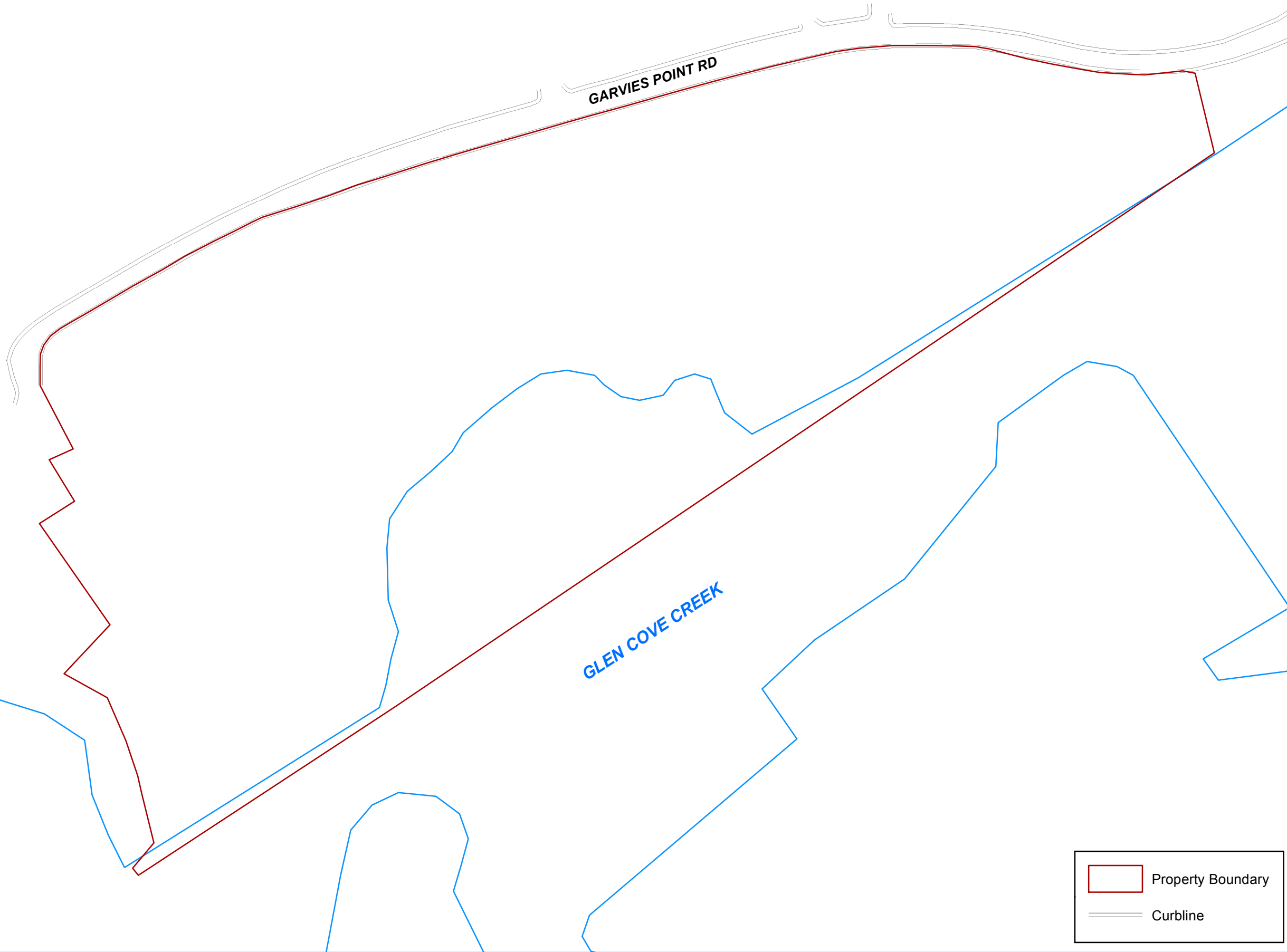
P.W. GROSSER CONSULTING, INC.

630 Johnson Avenue, Suite 7
Bohemia, NY 11716-2618
Phone: (631) 589-6353 • Fax: (631) 589-8705
E-mail: INFO@PWGROSSER.COM

Project:	RG11504
Date:	3/7/2016
Designed by:	DE
Drawn by:	JCG
Approved by:	DE
Figure No:	1



Document Path: G:\Projects\W-R\RG\1504\mapfiles\CC-RAWP-Fig2-SitePlan.mxd



Property Boundary

Curbline



PWGC

Strategic Environmental and Engineering Solutions

P.W. GROSSER CONSULTING, INC.

630 Johnson Avenue. • Suite 7
Bohemia • NY • 11716-2618
Phone: (631) 589-6353 • Fax: (631) 589-8705
E-mail: INFO@PWGROSSER.COM

UNAUTHORIZED ALTERATION OR ADDITION TO THIS
DRAWING AND RELATED DOCUMENTS IS A VIOLATION
OF SEC. 7209 OF THE N.Y.S. EDUCATION LAW

DRAWING PREPARED FOR:

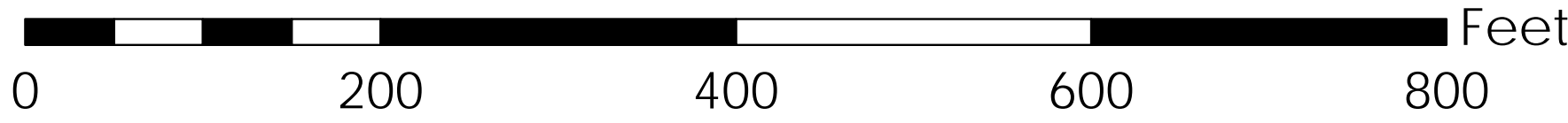
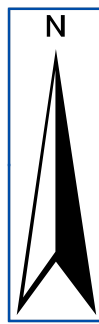
REVISION	DATE	INITIAL	COMMENTS
----------	------	---------	----------

DRAWING INFORMATION:

Project:	RG11504	Designed by:	DE
Date:	3/7/2016	Drawn by:	JCG
Scale:	AS SHOWN	Approved by:	DE

SITE PLAN
CAPTAINS COVE

FIGURE NO:
2



CC-C-051	
Constituent	Depth (feet bgs)
Grossly Contaminated Media	8-10'

CC-C-048	
Constituent	Depth (feet bgs)
Lead	8-10'

CC-GI-007	
Constituent	Depth (feet bgs)
Lead	2-4'
	4-6'
	6-8'

D2	
Constituent	Depth (feet bgs)
Grossly Contaminated Media	2-3'

CC-C-017	
Constituent	Depth (feet bgs)
Arsenic	0-2'

CC-C-004	
Constituent	Depth (feet bgs)
Lead	6-8'
	8-10'

GARVIES POINT RD

GLEN COVE CREEK

CC-C-022	
Constituent	Depth (feet bgs)
Arsenic	0-2'
	2-4'

CC-GI-006	
Constituent	Depth (feet bgs)
Lead	2-4'

CC-C-019	
Constituent	Depth (feet bgs)
Arsenic	0-2'
Lead	0-2'

CC-C-023	
Constituent	Depth (feet bgs)
Lead	6-8'

CC-C-008	
Constituent	Depth (feet bgs)
Lead	6-8'

CC-C-028	
Constituent	Depth (feet bgs)
Arsenic	0-2'
Lead	0-2'

CC-C-029	
Constituent	Depth (feet bgs)
Lead	8-10'

CC-C-030	
Constituent	Depth (feet bgs)
Lead	8-10'

REMEDIAL ACTION REMOVAL CRITERIA (RARC)

- | | |
|-------------------------------|--|
| 1. Arsenic | 175 mg/kg |
| 2. Lead | 660 mg/kg |
| 3. Radium-226 | SpCi/g (not including the natural background radiation of nuclide of approximately 1pCi/g) |
| 4. Thorium-232 | SpCi/g (not including the natural background radiation of nuclide of approximately 1pCi/g) |
| 5. Grossly Contaminated Media | As defined in Title 6 NYCRR Part 375-1.2(u) * |
| 6. NAPL | As defined in Title 6 NYCRR Part 375-1.2(ac) ** |

* Grossly contaminated media means soil, sediment, surface water or groundwater which contains sources or substantial quantities of mobile contamination in the form of NAPL, as defined in subdivision 375-1.2(ac), that is identifiable either visually, through strong odor, by elevated contaminant vapor levels or is otherwise readily detectable without laboratory analysis.

** NAPL means a contaminant that is a liquid which may be denser or lighter than water and does not mix easily or dissolve in water, but remains as a separate phase.

GENERAL NOTES

- ALL EXCAVATION AREAS ARE PROPOSED AT 5 FT BY 5 FT IN SIZE WITH THE EXCEPTION OF CC-C-051 AND CC-C-030 WHICH ARE PROPOSED AT 15 FT BY 15 FT IN SIZE, DEPTHS AS NOTED. TO BE EXPANDED UNTIL RARC ACHIEVED OR UNTIL THE WATER TABLE IS REACHED.
- DURING THE 2014 DATA GAP INVESTIGATION & SUBSEQUENT TEST PITS CONDUCTED AT THE CC-C-051 LOCATION, GROSSLY CONTAMINATED MEDIA WAS FOUND TO EXIST AT 8-10 FT BELOW LAND SURFACE.
- SOILS OVERLYING THE INTERVAL TARGETED FOR REMEDIATION WILL BE STOCKPILED & TESTED FOR REUSE OR DISPOSED OF OFFSITE.
- CONFIRMATORY ENDPOINT SAMPLES WILL BE COLLECTED IN ACCORDANCE WITH DER-10. ONE CONFIRMATORY ENDPOINT SAMPLE PER EVERY 30 LINEAR FT OF SIDEWALL & ONE CONFIRMATORY ENDPOINT SAMPLE PER EVERY 900 FT2 OF EXCAVATION BOTTOM. CONFIRMATORY ENDPOINT SAMPLES WILL BE ANALYZED IN ACCORDANCE WITH THE APPROVED RAWP.
- THE NEW YORK BUILDING CODE SHALL GOVERN THE CONDUCT OF ALL CONSTRUCTION EXCAVATION WITH REGARD TO THE SAFETY OF THE PUBLIC AND PROPERTY. ALL WORKERS SHALL BE OSHA TRAINED AS PER THE APPROVED RAWP.
- SURVEYS AND INSPECTIONS AT PROJECT MILESTONES SHALL BE PERFORMED AS PER THE APPROVED RAWP.
- NOTIFICATIONS WILL BE SUBMITTED AS PER THE APPROVED RAWP.
- THE VOLUME OF SOIL TO BE REMOVED AND REPLACED WILL BE DETERMINED BY CONFIRMATORY ENDPOINT SAMPLING.
- EXCAVATED SOILS EXCEEDING RARC WILL BE STOCKPILED ON POLYETHYLENE SHEETING, CHARACTERIZED, AND DISPOSED OF OFFSITE IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.
- THE CONTRACTOR SHALL PROVIDE SITE SIGNAGE AND CONTROLS AS REQUIRED IN THE APPROVED RAWP.
- THE CONTRACTOR SHALL FOLLOW THE EXCAVATION WORK PLAN REQUIREMENTS OF THE APPROVED RAWP.
- SITE RESTORATION SHALL CONSIST OF INSTALLATION OF A DEMARCATION LAYER, BACKFILL WITH SOILS APPROVED FOR REUSE OR IMPORTED CLEAN FILL MATERIAL, COMPACTION, & GRADING OF ANY AREA DISTURBED BY EXCAVATION OR SOIL STOCKPILING ACTIVITIES.
- COMMUNITY AIR MONITORING AND WORKER PROTECTION MONITORING SHALL BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF THE APPROVED RAWP.
- GROSSLY CONTAMINATED MEDIA & NAPL IF ENCOUNTERED, WILL BE REMOVED, CHARACTERIZED, AND DISPOSED OF OFFSITE IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.
- EXCAVATIONS EXCEEDING OSHA SLOPING AND BENCHING REQUIREMENTS AS SPECIFIED IN 1926 SUBPART P, APPENDIX B SHALL BE EXCAVATED USING SHIELDING AS SPECIFIED IN OSHA TECHNICAL MANUAL SECTION V, CHAPTER 2.
- THE DEPICTED EXCAVATION LIMITS ARE NOT TO SCALE

- Property Boundary
- Proposed Redevelopment Area
- Limits of 1998 "Delisted Area"
- Approximate EPA Remediation Area A
- Approximate EPA Remediation Area A Prime
- Approximate EPA Remediation Area G
- Approximate EPA Remediation Area G Prime
- NYSDEC Superfund Site
- Location of proposed removal.
- Not depicted to scale.
- See Plan Notes for additional information.

CC-C-001	
Constituent	Depth (feet bgs)
LOCATION NUMBER CONSTITUENT EXCEEDING RAO AND INTERVAL WHERE EXCEEDANCE WAS FOUND	


PWGC
Strategic Environmental and Engineering Solutions
P.W. GROSSER CONSULTING, INC.
630 Johnson Avenue, • Suite 7
Bohemia • NY • 11716-2618
Phone: (631) 589-6353 • Fax: (631) 589-8705
E-mail: INFO@PWGROSSER.COM

UNAUTHORIZED ALTERATION OR ADDITION TO THIS
DRAWING AND RELATED DOCUMENTS IS A VIOLATION
OF SEC. 1209 OF THE N.Y.S. EDUCATION LAW

DRAWING PREPARED FOR:

REMEDIAL
EXCAVATION
PLAN

CAPTAIN'S COVE
GLEN ISLE

REVISION	DATE	INITIAL	COMMENTS
----------	------	---------	----------

DRAWING INFORMATION:

Project:	RG11504	Designed by:	DE
Date:	3/10/2016	Drawn by:	JCG
Scale:	AS SHOWN	Approved by:	DE

FIGURE NO:

3

TABLES

Table 1

Location	Sample ID	Primary Contaminants	Proposed Excavation Size	Proposed Excavation Depth Interval	Notes
Captain's Cove	CC-C-004	Lead	5'-0" X 5'-0"	6'-0" to 8'-0" BGS	Soil excavated from ground surface to 6'-0" will be segregated and stockpiled separately for potential re-use on-site. Sampling of overlying soils will be performed consistent with the SMP requirements for Agency review and approval prior to on-site reuse.
	CC-C-008	Lead	5'-0" X 5'-0"	6'-0" to 8'-0" BGS	Soil excavated from ground surface to 6'-0" will be segregated and stockpiled separately for potential re-use on-site. Sampling of overlying soils will be performed consistent with the SMP requirements for Agency review and approval prior to on-site reuse.
	CC-C-017	Arsenic	5'-0" X 5'-0"	0'-0" to 4'-0" BGS	
	CC-C-019	Arsenic	5'-0" X 5'-0"	0'-0" to 4'-0" BGS	
		Lead			
	CC-C-022	Arsenic	5'-0" X 5'-0"	0'-0" to 6'-0" BGS	
	CC-C-023	Lead	5'-0" X 5'-0"	6'-0" to 8'-0" BGS	Soil excavated from ground surface to 6'-0" will be segregated and stockpiled separately for potential re-use on-site. Sampling of overlying soils will be performed consistent with the SMP requirements for Agency review and approval prior to on-site reuse.
	CC-C-028	Arsenic	5'-0" X 5'-0"	0'-0" to 4'-0" BGS	
		Lead			
	CC-C-029	Lead	5'-0" X 5'-0"	4'-0" to 10'-0" BGS	Soil excavated from ground surface to 4'-0" will be segregated and stockpiled separately for potential re-use on-site. Sampling of overlying soils will be performed consistent with the SMP requirements for Agency review and approval prior to on-site reuse.
	CC-C-030	Lead	15'-0" X 15'-0"	8'-0" to 10'-0" BGS	Soil excavated from ground surface to 8'-0" will be segregated and stockpiled separately for potential re-use on-site. Sampling of overlying soils will be performed consistent with the SMP requirements for Agency review and approval prior to on-site reuse.
	CC-C-048	Lead	5'-0" X 5'-0"	6'-0" to 10'-0" BGS	Soil excavated from ground surface to 6'-0" will be segregated and stockpiled separately for potential re-use on-site. Sampling of overlying soils will be performed consistent with the SMP requirements for Agency review and approval prior to on-site reuse.
	CC-C-051	Grossly Contaminated Media	15'-0" X 15'-0"	0'-0" to 10'-0" BGS	
	CC-GI-006	Lead	5'-0" X 5'-0"	2'-0" to 4'-0" BGS	Soil excavated from ground surface to 2'-0" will be segregated and stockpiled separately for potential re-use on-site. Sampling of overlying soils will be performed consistent with the SMP requirements for Agency review and approval prior to on-site reuse.
	CC-GI-007	Lead	5'-0" X 5'-0"	2'-0" to 8'-0" BGS	Soil excavated from ground surface to 2'-0" will be segregated and stockpiled separately for potential re-use on-site. Sampling of overlying soils will be performed consistent with the SMP requirements for Agency review and approval prior to on-site reuse.
	D2	Grossly Contaminated Media	5'-0" X 5'-0"	0'-0" to 6'-0" BGS	

Note: Refer to Pre-Construction Remedial Action Work Plan for additional information regarding proposed backfill and sampling protocols.

Table 2
Soil Analytical Results for Metals

Client Sample ID:	Site Specific	CC-C-001			CC-C-004			CC-C-008			CC-C-017			CC-C-019			CC-C-022			CC-C-023			CC-C-028			CC-C-029		
Sample Depth:	Removal Criteria	0-2'	2-4'	10-12'	0-2'	6-8'	8-10'	0-2'	4-6'	6-8'	0-2'	4-6'	6-8'	0-2'	4-6'	6-8'	0-2'	2-4'	6-8'	0-2'	4-6'	6-8'	0-2'	4-6'	6-8'	0-2'	2-4'	8-10'
Laboratory ID:		480-54686-1	480-54686-2	480-54686-3	480-54686-10	480-54686-11	480-54686-12	480-54686-22	480-54686-23	480-54686-24	480-54779-13	480-54779-14	480-54779-15	480-54779-19	480-54779-20	480-54779-21	480-54779-28	480-54779-29	480-54779-30	480-54779-31	480-54779-32	480-54779-33	480-54836-30	480-54836-31	480-54836-32	480-55092-1	480-55092-9	480-55092-2
Sampling Date:		2/11/2014	2/11/2014	2/11/2014	2/11/2014	2/11/2014	2/11/2014	2/11/2014	2/11/2014	2/11/2014	2/12/2014	2/12/2014	2/12/2014	2/12/2014	2/12/2014	2/12/2014	2/12/2014	2/12/2014	2/12/2014	2/12/2014	2/12/2014	2/12/2014	2/14/2014	2/14/2014	2/14/2014	2/19/2014	2/19/2014	2/19/2014
Total Metals (mg/kg)																												
Arsenic, Total	175	37.8 J	51.7 J	14.5 J	3.9 J	12.8 J	13.9 J	3.7 J	3.7 J	18.9	241	15.9	11.6	1,850	13.5 J	12.7 J	379 J	500 J	11.1 J	16.9 J	15.1 J	12.9 J	253	19.2	7.2 J	5.8 J	8.6 J	8.4 J
Lead, Total	660	151 J	217 J	53.3 J	31.7 J	892 J	257 J	53	32.2	726	194 J	320 J	187 J	772 J	274 J	300 J	212 J	398 J	194 J	90.8 J	436 J	6,030 J	696 J	389 J	285 J	102 J	169 J	1,180 J
Client Sample ID:	Site Specific	CC-C-030			CC-C-048			CC-C-051			CC-GI-006			CC-GI-007			D-2											
Sample Depth:	Removal Criteria	0-2'	2-4'	8-10'	0-2'	4-6'	8-10'	0-2'	2-4'	8-10'	0-2'	2-4'	4-6'	6-8'	8-10'	0-2'	2-4'	4-6'	6-8'	8-10'	0.5-1'	2-3'	6-7'	11-12'				
Laboratory ID:		480-54836-10	480-54836-11	480-54836-13	480-55157-1	480-55157-3	480-55157-4	480-55157-12	480-55157-13	480-55157-14	460-93794-18	460-93794-19	460-93794-20	460-93794-21	460-93794-22	460-93794-32	460-93794-33	460-93794-34	460-93794-35	460-93794-36								
Sampling Date:		2/14/2014	2/14/2014	2/14/2014	2/21/2014	2/21/2014	2/21/2014	2/21/2014	2/21/2014	2/21/2014	4/21/2015	4/21/2015	4/21/2015	4/21/2015	4/21/2015	4/22/2015	4/22/2015	4/22/2015	4/22/2015	4/22/2015	11/10/2003	11/10/2003	11/10/2003	11/3/2003				
Total Metals (mg/kg)																												
Arsenic, Total	175	4.6 J	7.3 J	15.8	3.9 J	4.1 J	9.8 J	6.3 J	9.2 J	7.7 J	14.4	14.7	7.8	7.6	11.3	15.1	14.8	15.3	5.2	4.7	6.72	ND	3.2	3.65				
Lead, Total	660	43.9 J	68.7 J	983 J	17.3	90.9	699	82.2 J	165 J	84.3 J	114	738	224	164	234	159	741	717	1,800	17.4	37.5	60.3	55.7	97.9				

Notes:
J - Data are flagged (J) when a QC analysis fails outside the primary acceptance limits. The qualified "J" data are not excluded from further review or consideration. However, only one flag (J) is applied to a sample result, even though several associated QC analyses may fail. The "J" data may be biased high or low or the direction of the bias may be indeterminable.
Highlighted text denotes concentrations exceeding Site Specific Removal Criteria

APPENDIX A HEALTH AND SAFETY PLAN

P.W. GROSSER CONSULTING, INC.
PROJECT No. RGI1504

HEALTH AND SAFETY PLAN

GARVIES POINT WATERFRONT REVITALIZATION PROJECT
GELN COVE, NEW YORK

SUBMITTED:
March 2016

PREPARED FOR:
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A, Section C
625 Broadway
Albany, New York 12233

United States Environmental Protection Agency
Region 2
290 Broadway, 20th Floor
New York, New York 10007

ON BEHALF OF:
RXR-Glen Isle Partners, LLC
625 RXR Plaza
Uniondale, New York 11556

PREPARED BY:
P.W. Grosser Consulting, Inc.
630 Johnson Avenue, Suite 7
Bohemia, New York 11716

TABLE OF CONTENTS		PAGE
1.0	STATEMENT OF COMMITMENT	1
2.0	INTRODUCTION	2
2.1	Purpose	2
2.2	Scope	2
2.3	Application	3
3.0	PROJECT ORGANIZATION AND RESPONSIBILITIES	4
3.1	Project Manager	4
3.2	Field Team Leader (FTL)/ Site Health and Safety Officer (SHSO)	4
3.3	Health and Safety Manager	4
3.4	Site Personnel	4
4.0	SITE HISTORY AND PROJECT DESCRIPTION	5
4.1	Project Background	5
4.2	Site Location and Description	5
5.0	POTENTIAL HAZARDS OF THE SITE	6
5.1	Chemical Hazards	6
5.2	Biological Hazards	10
5.2.1	Animals	10
5.2.2	Insects	10
5.2.3	Plants	10
5.3	Physical Hazards	11
5.3.1	Temperature Extremes	11
5.3.2	Steam, Heat and Splashing	11
5.3.3	Noise	11
5.3.4	Fire and Explosion	11
5.3.5	Manual Lifting/Material Handling	12
5.3.6	Slips, Trips and Falls	12
5.3.7	Heavy Equipment Operation	12
5.3.8	Electrocution	12
6.0	ACTIVITY HAZARD ANALYSES	13
7.0	PERSONAL PROTECTIVE EQUIPMENT	14
7.1	PPE Abbreviations	14
7.2	Hazard Assessment for Selection of Personal Protective Equipment	15
7.3	Respirator Cartridge Change-Out Schedule	1
8.0	AIR MONITORING	3
9.0	ZONES, PROTECTION AND COMMUNICATION	4
9.1	Site Control	4
9.2	Contamination Control	5
9.2.1	Personnel Decontamination Station	5
9.3	Communication	5
10.0	MEDICAL SURVEILLANCE PROCEDURES	6
10.1	Medical Surveillance Requirements	6
10.2	Medical Data Sheet	6
11.0	SAFETY CONSIDERATIONS	7
11.1	General Health and Safety Work Practices	7
11.2	The Buddy System	7
11.3	Sample Handling	7
11.4	Excavation	7
12.0	DISPOSAL PROCEDURES	8
13.0	EMERGENCY RESPONSE PLAN	9
13.1	Responsibilities	9
13.1.1	Health and Safety Manager (HSM)	9
13.1.2	Field Team Leader/Site Health and Safety Officer (FOL/HSO)	9

13.1.3	Emergency Coordinator	9
13.1.4	Site Personnel	10
13.2	Communication.....	10
13.2.1	Hand Signals.....	10
13.2.2	Field Radios and Cell Phones	10
13.3	Local Emergency Support Units	10
13.4	Pre-Emergency Planning.....	10
13.5	Emergency Medical Treatment	12
13.6	Emergency Site Evacuation Routes and Procedures	13
13.7	Fire Prevention and Protection.....	14
13.7.1	Fire Prevention.....	14
13.8	Overt Chemical Exposure	14
13.9	Decontamination during Medical Emergencies	15
13.10	Accident/Incident Reporting	15
13.11	Adverse Weather Conditions	15
13.12	Spill Control and Response.....	16
13.13	Emergency Equipment.....	16
14.0	TRAINING	18
14.1	General Health and Safety Training	18
14.1.1	Three Day Supervised On the Job Training	18
14.2	Annual Eight-Hour Refresher Training	18
14.3	Site-Specific Training.....	18
14.4	On-Site Safety Briefings	18
14.5	First Aid and CPR.....	19
14.6	Supervisory Training	19
15.0	LOGS, REPORTS AND RECORDKEEPING	20
15.1	Medical and Training Records	20
15.2	Incident Report and Investigation Form	20
15.3	Health and Safety Logbooks	20
16.0	FIELD PERSONNEL REVIEW	21

TABLES

Table 5-1	Chemical Hazards
Table 7-1	Personal Protective Equipment Selection
Table 13-1	Emergency Telephone Numbers

APPENDICES

Appendix A	Material Safety Data Sheets
Appendix B	Activity Hazard Analyses
Appendix C	Heat/Cold Stress Protocols
Appendix D	Medical Data Sheet
Appendix E	General Health and Safety Work Practices
Appendix F	Hospital Route Map and Directions
Appendix G	Incident Report Form / Investigation Form
Appendix H	Daily Briefing Sign-In Sheet

1.0 STATEMENT OF COMMITMENT

This Health and Safety Plan (HASP) has been prepared to ensure that workers are not exposed to chemical, biological and physical hazards during the planned remedial action (RA) to be performed at the Captain's Cove Site (the Site), Glen Cove, New York. P.W. Grosser Consulting Inc.'s (PWGC's) policy is to minimize the possibility of work-related exposure through awareness and qualified supervision, health and safety training, medical monitoring, use of appropriate personal protective equipment, and the following activity specific safety protocols contained in this HASP. PWGC has established a guidance program to implement this policy in a manner that protects personnel to the maximum reasonable extent.

This HASP, which applies to persons present at the Site actually or potentially exposed to safety or health hazards, describes emergency response procedures for actual and potential physical, biological and chemical hazards. This HASP is also intended to inform and guide personnel entering the work area or exclusion zone. Persons are to acknowledge that they understand the potential hazards and the contents of this Health and Safety policy.

2.0 INTRODUCTION

2.1 Purpose

This HASP addresses the minimum health and safety practices that will be employed by Site workers participating in RA activities at the Site.

The HASP takes into account the specific hazards inherent to the site and presents the minimum requirements which are to be met by PWGC, its' subcontractors, and other on-Site personnel in order to avoid and, if necessary, protect against health and/or safety hazards. PWGC sub-contractors will have the option of adopting this HASP or developing their own Site-specific document. If a subcontractor chooses to prepare their own HASP, it must meet the minimum requirements as detailed in this HASP and must be made available to PWGC.

Activities performed under this HASP will comply with applicable parts of Occupational Safety and Health Administration (OSHA) Regulations, primarily 29 Code of Federal Regulations (CFR) Parts 1910 and 1926 and all other applicable federal, state, and local regulations. Modifications to the HASP may be made with the approval of the PWGC Health and Safety Manager (HSM) and/or Project Manager (PM). A copy of this HASP will be maintained on-Site during all work activities.

Refusal to comply with the HASP or violation of any safety procedures by field personnel may result in their immediate removal from the Site following consultation with the HSM and the Field Team Leader (FTL).

2.2 Scope

This HASP addresses the potential hazards related to the RA activities. The primary RA activities include the following:

- Site Mobilization/Demobilization;
- Excavation; and;
- Soil Sampling

The potential hazards associated with this scope are listed below and are discussed in more detail in this HASP after the project organization and responsibilities section.

- Chemical Hazards
- Biological Hazards
- Physical Hazards

2.3 Application

The HASP applies to all personnel involved in the above tasks who wish to gain access to active work areas, including but not limited to:

- PWGC employees and subcontractors;
- Client representatives; and
- Federal, state or local representatives.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section specifies the project organization and responsibilities.

3.1 Project Manager

- Participates in major incident investigations;
- Ensures that the HASP has all of the required approvals before Site work is conducted; and
- Has the overall project responsibility for project health and safety.

3.2 Field Team Leader (FTL)/ Site Health and Safety Officer (SHSO)

- Ensures that the HASP is implemented in conjunction with the HSM;
- Ensures that field work is scheduled with adequate equipment to complete the job safely;
- Enforces Site health and safety rules;
- Ensures that proper personal protective equipment is utilized;
- Ensures that the HSM is informed of project changes that require modifications to the HASP;
- Ensures that the procedure modifications are implemented;
- Investigates incidents;
- Conducts the Site safety briefing;
- Reports to HSM to provide summaries of field operations and progress; and
- Acts as Emergency Coordinator.

3.3 Health and Safety Manager

- Provides for the development of the HASP;
- Serves as the primary contact to review health and safety matters that may arise;
- Approves individuals who are assigned SHSO responsibilities;
- Coordinates revisions of this HASP with field personnel; and
- Assists in the investigation of major accidents.

3.4 Site Personnel

- Report any unsafe or potentially hazardous conditions to the FTL/SHSO;
- Maintain knowledge of the information, instructions and emergency response actions contained in this HASP; and
- Comply with rules, regulations and procedures as set forth in this HASP and any revisions.

4.0 SITE HISTORY AND PROJECT DESCRIPTION

4.1 Project Background

This HASP has been prepared by PWGC, on behalf of RXR–Glen Isle Partners, LLC (RXRGI) for the removal of hot spots identified on the Site. Metals have been identified above Site Specific Removal Criteria (SSRC) and grossly contaminated media was identified in soil at the Site.

4.2 Site Location and Description

The Site is located along Garvies Point Roads in Glen Cove, New York. Redevelopment associated with the Garvies Point Waterfront Revitalization Project (GPWRP) will include restricted-residential, commercial and retail space, as well as open space and public amenities.

5.0 POTENTIAL HAZARDS OF THE SITE

This section presents an assessment of the chemical, radioactivity, biological, and physical hazards that may be encountered during the tasks specified under Section 1.0. Additional information can be found in **Appendix A** - Material Safety Data Sheets or in **Appendix B** - Activity Hazard Analyses.

5.1 Chemical Hazards

Review of historical information and investigations from the Site indicates that the soil at the Site are contaminated with volatile organic compounds, semi-volatile organic compounds, and metals which are present at ppm levels in soil. These compounds may present an occupational exposure hazard during Site operations.

The chemicals identified above may have an effect on the central nervous system, respiratory system and may cause chronic liver and kidney damage. Acute exposure symptoms may include headache, dizziness, nausea, diarrhea and skin and eye irritation. Specific information on the chemicals identified at the Site can be found in Table 5-1 as well as on the Material Safety Data Sheets found in **Appendix A**.

Radiation may be also present on the Site. Radiation may have an adverse effect on tissue cells and is considered a carcinogen. The primary routes of exposure are absorption, inhalation and ingestion. Acute exposure may include skin irritation, vomiting, nausea, headache, diarrhea and fevers.

Table 5-1
Chemical Hazards

COMPOUND	CAS#	OSHA PEL	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
Arsenic	7440-38-2	TWA 0.5 mg/m ³	Inhalation Ingestion Skin/Eye	Irritation skin, possible dermatitis, respiratory distress, diarrhea, kidney damage, muscle tremor, convulsions, possible gastrointestinal tract, reproductive effects, possible liver damage.	Skin, respiratory system, kidneys, central nervous system, liver, gastrointestinal tract, reproductive system	VP= unavailable Appearance and odor vary depending upon the specific organic arsenic
Barium	7440-39-3	TWA 0.5 mg/m ³	Ingestion	Cough, sore throat, skin redness, eye redness, eye pain.	Skin, eyes, respiratory tract	Yellowish to white lustrous solid in various forms
Benzo(a) anthracene	56-55-3	None	Inhalation Ingestion Skin/Eye	None	None	Flakes or Powder
Benzo(a) Pyrene	50-32-8	None	Inhalation Ingestion Skin/Eye	None	None	Crystals
Benzo(b) Fluoranthene	205-99-2	None	Inhalation Ingestion Skin/Eye	None	None	Crystals
Benzo(k)fluoranthene	207-08-9	None	Inhalation Skin	None	None	Yellow Crystals
Cadmium	7440-43-9	TWA 0.002 mg/m ³	Inhalation Ingestion	Cough, sore throat, redness, pain, abdominal pain, diarrhea, headache, nausea, vomiting	Kidneys	Soft Blue-White Metal Lumps or Grey powder
Chrysene	218-01-9	None	Inhalation Ingestion Skin/Eye	None	None	Crystals

COMPOUND	CAS#	OSHA PEL	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
Copper	7440-50-8	TWA 0.2 mg/m ³	Inhalation Ingestion	Cough, headache, shortness of breath, sore throat, redness, pain, abdominal pain, nausea, vomiting	None	Red powder
Dibenzo(a,h)anthracene	53-70-3	None	Inhalation Ingestion Skin	Redness, swelling, itching	None	Colorless crystalline powder
Dieldrin	60-57-1	TWA 0.25 mg/m ³	Inhalation Ingestion Skin/Eye	Convulsions, dizziness, headache, nausea, vomiting, muscle twitching may result from ingestion.	CNS, liver, kidneys, skin	VP= 0.0004 mm Hg Colorless to tan crystal; mild odor
Ideno(1,2,3-cd)pyrene	193-39-5	None	Inhalation Ingestion Skin/Eye	None	None	Yellow Crystals
Lead	7439-92-1	TWA 0.5 mg/m ³	Inhalation Ingestion Skin/Eye	Lassitude, insomnia, facial pallor, anorexia, weight loss, malnutrition, constipation, abdominal pain, colic, anemia, gingival lead line, tremor, paralysis wrist, ankles, encephalopathy, kidney disease, irritation eyes, hypertension	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue	VP= 0.00000 mmHg Heavy, ductile, soft, gray solid
Mercury	7439-97-6	TWA 0.025 mg/m ³	Inhalation Ingestion Skin/Eye	Abdominal pain, cough, diarrhea, shortness of breath, vomiting, fever	Central nervous system, kidneys	Silvery liquid metal
Nickel	7440-02-0		Inhalation	May cause mechanical irritation, Inhalation of fumes may cause pneumonitis.	Skin, Lungs.	Silvery metallic solid in various forms.
Toluene	108-88-3	TWA 100 ppm	Inhalation, skin absorption, ingestion, skin/eye	Irritation eyes, nose, lassitude, confusion, euphoria, dizziness, headache, dilated pupils, lacrimation, anxiety, muscle fatigue, insomnia, paresthesia, dermatitis, liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	VP= 21 mmHg Colorless liquid with a sweet, pungent, benzene-like odor

COMPOUND	CAS#	OSHA PEL	ROUTES OF EXPOSURE	SYMPTOMS OF EXPOSURE	TARGET ORGANS	PHYSICAL DATA
Xylenes	95-47-6	TWA 100 ppm	Inhalation, skin absorption, ingestion, skin/eye	Irritation eyes, skin, nose, throat, dizziness, excitement, drowsiness, incoordination, staggering gait, corneal vacuolization, anorexia, nausea, vomiting, abdominal pain, dermatitis	Eyes, skin, respiratory system, central nervous system, liver, kidneys, blood, gastrointestinal	VP= 7mmHg Colorless liquid with an aromatic odor

Abbreviations

C = Ceiling limit, not to be exceeded

CNS = Central Nervous System

PEL=Permissible Exposure Limit

OSHA = Occupational Safety and Health Administration

ppm = parts per million

VP = vapor pressure at approximately 68° F in mm Hg (mercury)

TWA = Time-weighted average (8 hours)

5.2 Biological Hazards

Work will be performed in a developed area of Glen Cove, during the course of the project, there is potential for workers to come into contact with biological hazards such as animals, insects and plants. The Activity Hazard Analyses found in **Appendix B** includes specific hazards and control measures for each task, if applicable.

5.2.1 *Animals*

The Site is located in a predominantly developed with commercial businesses and residential housing. It is possible that birds, raccoon, foxes, possum, dogs, cats, rats and mice may be present. Workers shall use discretion and avoid all contact with animals.

5.2.2 *Insects*

Insects, such as mosquitoes, ticks, bees and wasps may be present during certain times of the year. Workers will be encouraged to wear repellents and PPE, if deemed necessary, when working in areas where insects are expected to be present.

During the months of April through October, particular caution must be exercised to minimize exposure to deer ticks and the potential for contracting Lyme disease. Specific precautionary work practices that are recommended include the following:

- Cover your body as much as possible. Wear long pants and long sleeved shirts. Light color clothing makes spotting of ticks easier.
- Try to eliminate possible paths by which the Deer Tick may reach unprotected skin. For example, tuck bottoms of pants into socks or boots and sleeves into gloves. (Duct tape may be utilized to help seal cuffs and ankles). If heavy concentrations of ticks or insects are anticipated or encountered, Tyvek coveralls may be utilized for added protection when the potential for heat stress is not a concern.
- Conduct periodic and frequent, (e.g., hourly), surveys of your clothing for the presence of ticks. Remove any tick, save it and report to the clinic with the tick.
- Use insect /tick repellents that contain the chemical DEET (n,n-Diethyltoluamide). Apply repellents in accordance with manufacturers' recommendations. These repellents are readily available and include such brands as Deep Woods OFF and Maximum Strength OFF.

5.2.3 *Plants*

Poison ivy, sumac and oak may be present on Site. The FTL/SHSO should identify the susceptible individuals. Worker shall avoid all contact with these plants.

5.3 Physical Hazards

Most safety hazards are discussed in the Activity Hazard Analyses (AHA) in **Appendix B** for the different phases of the project. In addition to the AHAs, general work rules and other safety procedures are described in Section 10 of this HASP.

5.3.1 *Temperature Extremes*

Heat Stress

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke.

Cold Stress

At certain times of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia as well as slippery surfaces, brittle equipment, and poor judgment.

PWGC's Heat/Cold Stress Protocols are specified in **Appendix C**.

5.3.2 *Steam, Heat and Splashing*

Exposure to steam/heat/splashing hazards can occur during steam cleaning activities. Splashing can also occur during well development and sampling activities. Exposure to steam/heat/splashing can result in scalding/burns, eye injury, and puncture wounds.

5.3.3 *Noise*

Noise is a potential hazard associated with the operation of heavy equipment, drill rigs, pumps and engines. Workers will wear hearing protection while in the work zone when these types of machinery are operating.

5.3.4 *Fire and Explosion*

When conducting excavation or drilling activities, the opportunity of encountering fire and explosion hazards may exist from encountering underground utilities, from the use of diesel engine equipment, and other potential ignition sources. During dry periods there is an increased chance of forest and brush fires starting at the job Site. If these conditions occur no smoking will be permitted at the site and all operations involving potential ignition sources will be monitored continuously (fire watch).

5.3.5 *Manual Lifting/Material Handling*

Manual lifting of heavy objects may be required. Failure to follow proper lifting technique can result in back injuries and strains. Back injuries are a serious concern as they are the most common work place injury, often resulting in lost or restricted work time, and long treatment and recovery periods.

5.3.6 *Slips, Trips and Falls*

Working in and around the Site will pose slip, trip and fall hazards due to slippery surfaces that may be oil covered, or from rough terrain, surfaces that are steep inclines, surfaced debris, or surfaces which are wet from rain or ice. Falls may result in twisted ankles, broken bones, head trauma or back injuries.

5.3.7 *Heavy Equipment Operation*

An excavator/backhoe will be used to excavate where required. Working with or near heavy equipment poses many potential hazards, including electrocution, fire/explosion, being struck by or against, or pinched/caught/crushed by, and can result in serious physical harm.

5.3.8 *Electrocution*

Encountering underground utilities may pose electrical hazards to workers. Potential adverse effects of electrical hazards include burns and electrocution, which could result in death.

6.0 ACTIVITY HAZARD ANALYSES

The Activity Hazard Analysis (AHA) is a systematic way of identifying the potential health and safety hazards associated with major phases of work on the project and the methods to avoid, control and mitigate those hazards. The AHAs will be used to train work crews in proper safety procedures during phase preparatory meetings.

AHAs have been developed by PWGC for the following phases of work:

1. Site Mobilization/Demobilization;
2. Excavation; and
3. Decontamination

Copies of these AHAs are included in **Appendix B** of this HASP.

7.0 PERSONAL PROTECTIVE EQUIPMENT

The personal protective equipment (PPE) specified in **Table 7-1** represents the hazard analysis and PPE selection required by 29 CFR 1910.132. Specific information on known potential hazards can be found under Section 4.0 and **Appendix B** - Activity Hazard Analyses. For the purposes of PPE selection, the HSM and FTL/SHSO are considered competent persons. The signatures on the approval page of the HASP constitute certification of the hazard assessment. For activities not covered by **Table 7-1**, the FTL/SHSO will conduct the hazard assessment, select the PPE, and document changes in the appropriate field logs. PPE selection will be made in consultation with the HSM.

Modifications for initial PPE selection may also be made by the FTL/SHSO in consultation with the HSM and changes documented accordingly. If major modifications occur, the HSM will notify the PM.

7.1 PPE Abbreviations

HEAD PROTECTION

HH = Hard Hat

HEARING PROTECTION

EP = ear plugs

EM = ear muffs

HAND PROTECTION

Cot = cotton

But = Butyl

LWG = Leather Work Gloves

Neo = Neoprene

Nit = Nitrile

Sur = Surgical

EYE/FACE PROTECTION

APR = Full Face Air Purifying
Respirator

MFS = Mesh Face shield

PFS = Plastic Face shield

SG = ANSI approved safety
glasses with side shields

BODY PROTECTION

WC = work clothes

Cot Cov = Cotton Coveralls

Poly = Polyethylene coated

Tyvek® coveralls

Saran = Saranex coated
coveralls

Tyvek® = Uncoated Tyvek®
coveralls

FOOT PROTECTION

Neo = Neoprene

OB = Overboot

Poly = polyethylene coated boot

Rub = rubber slush boots

STB = Leather work boots with steel
toe

RESPIRATORY PROTECTION

APR = Full-face air purifying
respirator with organic vapor
cartridges

ASR = Full face air supplied
respirator with escape bottle

SCBA = Self-contained breathing
apparatus

7.2 Hazard Assessment for Selection of Personal Protective Equipment

The initial selection of personal protective equipment for each task was done by performing a hazard assessment taking into consideration the following:

- Potential chemical and physical present;
- Work operations to be performed;
- Potential routes of exposure;
- Concentrations of contaminants present; and
- Characteristics, capabilities and limitations of PPE and any hazard that the PPE presents or magnifies.

A review of the analytical data from previous sampling events indicates that metals identified in **Table 5-1** are the primary contaminants of concern. The maximum concentration detected for contaminants of concern in soil are as follows:

- Arsenic 1,850 ppm
- Lead 6,030 ppm
- Mercury 6.2 ppm

The exposure routes for these chemicals are inhalation, skin absorption, skin/eye contact and ingestion. Chemical protective gloves will be required for all activities that involve sample handling and the likelihood for skin contact. The proper use of PPE and strict adherence to decontamination and personal hygiene procedures will effectively minimize skin contact and ingestion as potential routes of exposure.

Table 7-1
Personal Protective Equipment Selection

TASK	HEAD	EYE/FACE	FEET	HANDS	BODY	HEARING	RESPIRATOR
Mobilization/ Demobilization	HH	SG	STB	WG	WC	None	None
Excavation, loading and backfilling	HH	SG	STB	WG	WC	EM or EP	None initially APR if action levels exceeded
Decontamination	HH	SG	STB	Nit + Sur	WC, Tyvek® as needed	None	None initially APR if action levels exceeded

7.3 Respirator Cartridge Change-Out Schedule

A respirator cartridge change-out schedule has been developed in order to comply with 29 CFR 1910.134. If the use of respirators is necessary, the respirator cartridge change-out schedule for this project will be as follows:

1. Cartridges shall be removed and disposed of at the end of each shift, when cartridges become wet or wearer experiences breakthrough, whichever occurs first; and
2. If the humidity exceeds 85%, then cartridges shall be removed and disposed of after 4 hours of use.

Respirators shall not be stored at the end of the shift with contaminated cartridges left on. Cartridges shall not be worn on the second day, no matter how short of time period they were used the day before.

The schedule was developed based on the following scientific information and assumptions:

- Analytical data that is available regarding site contaminants;
- Using the Rule of Thumb provided by the AIHA;
- All of the chemicals have boiling points greater than 70°C;
- Total airborne concentration of contaminants is anticipated to be less than 200 ppm;
- The humidity is expected to be less than 85%; and
- Desorption of the contaminants (including those with poor warning properties) after partial use of the chemical cartridge can occur after a short period (hours) without use (eg, overnight) and result in a non-use exposure.

The following is a partial list of factors that may affect the usable cartridge service life and/or the degree of respiratory protection attainable under actual workplace conditions. These factors have been considered when developing the cartridge change-out schedule.

Type of contaminant(s);

- Contaminant concentration;
- Relative humidity;
- Breathing rate; Temperature; Changes in contaminant concentration, humidity, breathing rate and temperature;
- Mixtures of contaminants;
- Accuracy in the determination of the conditions;

- The contaminant concentration in the workplace can vary greatly. Consideration must be given to the quality of the estimate of the workplace concentration;
- Storage conditions between multiple uses of the same respirator cartridges. It is recommended that the chemical cartridges be replaced after each work shift. Contaminants adsorbed on a cartridge can migrate through the carbon bed without airflow;
- Age of the cartridge;
- Condition of the cartridge and respirator;
- Respirator and cartridge selection respirator fit;
- Respirator assembly, operation, and maintenance;
- User training, experience and medical fitness;
- Warning properties of the contaminant; and
- The quality of the warning properties should be considered when establishing the chemical cartridge change schedule. Good warning properties may provide a secondary or back-up indication for cartridge change-out.

8.0 AIR MONITORING

Air monitoring will be performed for protection for on-Site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-Site workers not directly involved in the remedial work) from potential airborne contaminant releases resulting from remedial activities at the Site. Air monitoring will be used to help to confirm that the remedial work will not spread contamination off-site through the air. The primary concerns for this Site are dust particulates and VOCs. Monitoring with a photo-ionization detector (PID) will be performed during any invasive activities to help confirm that VOCs are not spread off-site.

Real-time monitoring for dust and VOCs will be conducted both within the work area, and along the Site perimeter, during intrusive activities such as excavation and sampling activities.

9.0 ZONES, PROTECTION AND COMMUNICATION

9.1 Site Control

Site zones are intended to control the potential spread of contamination throughout the Site and to assure that only authorized individuals are permitted into potentially hazardous areas. A three-zone approach will be utilized. It shall include an Exclusion Zone (EZ), Contamination Reduction Zone (CRZ) and a Support Zone (SZ). Specific zones shall be established on the work Site when operations begin.

This project is a hazardous waste remediation project, and any person working in an area where the potential for exposure to Site contaminants exists, will only be allowed access after providing the FTL/SHSO with proper training and medical documentation.

The zones are based upon current knowledge of proposed Site activities. It is possible that the zone configurations may be altered due to work plan revisions. Should this occur, the work zone will be adjusted accordingly, and documented through use of a field-change request form.

The following shall be used for guidance in revising these preliminary zone designations, if necessary.

Support Zone - The SZ is an uncontaminated area that will be the field support area for most operations. The SZ provides for field team communications and staging for emergency response. Appropriate safety equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.

Contamination Reduction Zone - The CRZ is established between the EZ and the SZ. The CRZ contains the contamination reduction corridor and provides for an area for decontamination of personnel and portable hand-held equipment, tools and heavy equipment. A personnel decontamination area will be prepared at each exclusion zone. The CRZ will be used for EZ entry and egress in addition to access for heavy equipment and emergency support services.

Exclusion Zone - All activities, which may involve exposure to site contaminants, hazardous materials and/or conditions, should be considered an EZ. The FTL/SHSO may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ shall be determined by the Site HSO allowing adequate space for the activity to be completed, field members and emergency equipment.

9.2 Contamination Control

Decontamination areas will be established for the following activities.

- Sampling Activities
- Excavation

9.2.1 Personnel Decontamination Station

All personnel and portable equipment used in the EZ shall be subject to a thorough decontamination process, as deemed necessary by the FTL/SHSO. Sampling equipment shall be decontaminated. As necessary, all boots and gloves will be decontaminated using soap and water solution and scrub brushes or simple removal and disposal. All used respiratory protective equipment will be decontaminated daily and sanitized with appropriate sanitizer solution.

All drums generated as a result of sampling and decontamination activities will be marked and stored at a designated area at the site until the materials can be properly disposed of off-site.

All non-expendable sampling equipment will be decontaminated. This usually entails the use of Alconox, solvent and distilled/deionized water rinses to eliminate contaminants.

9.3 Communication

- Each team member will have a Nextel cell phone/radio for communication with the PM, HSO and other team members during field activities.
- Hand Signals - Hand signals shall be used by field teams, along with the buddy system. The entire field team shall know them before operations commence and their use covered during site-specific training. Typical hand signals are the following:

SIGNAL

Hand gripping throat

Grip on a partner's wrist or placement of both hands around a partner's waist.

Hands on top of head

Thumbs up

Thumbs down

MEANING

Out of air, can't breathe

Leave the area immediately, no debate.

Need assistance

Okay, I'm all right, I understand.

No, negative.

10.0 MEDICAL SURVEILLANCE PROCEDURES

All contractor and subcontractor personnel performing field work where potential exposure to contaminants exists at the Site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120(f).

10.1 Medical Surveillance Requirements

A physician's medical release for work will be confirmed by the HSM before an employee can work in the exclusion zone. The examination will be taken annually at a minimum and upon termination of hazardous waste Site work if the last examination was not taken within the previous six months. Additional medical testing may be required by the HSM in consultation with the Corporate Medical Consultant and the FTL/SHSO if an over-exposure or accident occurs, if an employee exhibits symptoms of exposure, or if other Site conditions warrant further medical surveillance.

10.2 Medical Data Sheet

A medical data sheet is provided in **Appendix D**. This medical data sheet is voluntary and should be completed by all on-Site personnel and will be maintained at the Site. Where possible, this medical data sheet will accompany the personnel needing medical assistance. The medical data sheet will be maintained in a secure location, treated as confidential, and used only on a need-to-know basis.

11.0 SAFETY CONSIDERATIONS

11.1 General Health and Safety Work Practices

A list of general health and safety work practices is included as an included in **Appendix E**. The work rules will be posted in a conspicuous location at the site.

11.2 The Buddy System

At a minimum, employees shall work in groups of two in such a manner that they can observe each other and maintain line-of-sight for each employee within the work group. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

11.3 Sample Handling

Personnel responsible for the handling of samples should wear the prescribed level of protection. Samples should be identified as to their hazard and packaged as to prevent spillage or breakage. Sample containers shall be decontaminated in the CRZ or EZ before entering a clean Support Zone area. Any unusual sample conditions, odors, or real-time readings should be noted. Laboratory personnel should be advised of sample hazard level and the potential contaminants present. This can be accomplished by a phone call to the lab coordinator and/or including a written statement with the samples reviewing lab safety procedures in handling, in order to assure that the practices are appropriate for the suspected contaminants in the sample.

11.4 Excavation

Although extensive excavation is not anticipated for the scope of this project, excavations will be conducted in accordance with the requirements contained in 29 CFR 1926, Subpart P-Excavations. It provides for the designation of a "Competent Person" and general requirements for safe excavating practices. The program also incorporates company standards for the monitoring of potentially hazardous atmospheres; protection from water hazards; analyzing and maintaining the stability of adjacent structures; daily competent person inspections; soil classification; sloping and benching; protective systems; and training.

The Competent Person will be the FTL or other designee with appropriate training and experience. The Competent Person will be assisted in his/her duties by other technical personnel such as the HSM, geologists, structural engineers and soils engineers.

No entry into excavations will be allowed for this phase of the project.

12.0 DISPOSAL PROCEDURES

All discarded materials, waste materials or other objects shall be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard or causing litter to be left on site.

All potentially contaminated materials, e.g., clothing, gloves, etc., will be bagged or drummed as necessary, labeled and segregated for disposal. All non-contaminated materials will be collected and bagged for appropriate disposal as non-hazardous solid waste. Additional waste disposal procedures may be developed as applicable.

13.0 EMERGENCY RESPONSE PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures which are addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency Site evacuation procedures.

13.1 Responsibilities

13.1.1 Health and Safety Manager (HSM)

The HSM oversees and approves the Emergency Response/Contingency Plan and performs audits to determine that the plan is in effect and that all pre-emergency requirements are met. The HSM acts as a liaison to applicable regulatory agencies and notifies OSHA of reportable accidents.

13.1.2 Field Team Leader/Site Health and Safety Officer (FTL/HSO)

The FTL/SHSO is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The FTL/SHSO is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the HSM can ensure that OSHA is notified within the required time frame. The HSM will be notified of all OSHA recordable injuries, fires, spills, releases or equipment damage in excess of \$500 within 24 hours.

13.1.3 Emergency Coordinator

The Emergency Coordinator for the project is the FTL/SHSO.

The Emergency Coordinator shall make contact with Local Emergency Response personnel prior to beginning work on site. In these contacts the emergency coordinator will inform interested parties about the nature and duration of work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. The emergency coordinator will locate emergency phone numbers and identify hospital routes prior to beginning work on site. The emergency coordinator shall make necessary arrangements to be prepared for any emergencies that could occur.

The Emergency Coordinator will implement the Emergency Response/Contingency Plan whenever conditions at the site warrant such action.

13.1.4 *Site Personnel*

Site personnel are responsible for knowing the Emergency Response/Contingency Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a Site emergency.

13.2 **Communication**

A variety of communication systems may be utilized during emergency situations. These are discussed in the following sections.

13.2.1 *Hand Signals*

Downrange field teams will employ hand signals where necessary for communication during emergency situations. Hand signals are found in Section 8.3.

13.2.2 *Field Radios and Cell Phones*

PWGC field personnel are provided cellular phones with telephone and two-way radio capabilities for Site communication and emergency use.

13.3 **Local Emergency Support Units**

A route map from the Site to the nearest hospital can be found in **Appendix F**. This map will be placed with the above emergency telephone numbers in all on-Site vehicles.

13.4 **Pre-Emergency Planning**

PWGC will communicate directly with administrative personnel from the emergency room at the hospital to determine whether the hospital has the facilities and personnel needed to treat cases of trauma resulting from exposure to any of the contaminants expected to be found on the Site. Instructions for finding the hospital will be posted conspicuously in the Site office and in each Site vehicle.

Before the field activities begin, the local emergency response personnel will be notified of the schedule for field activities and about the materials that are thought to exist on the Site so that they will be able to respond quickly and effectively in the event of a fire, explosion, or other emergency. Before fieldwork on the Site commences, each person who will be working there or observing the operations will complete a medical data sheet (**Appendix D**). These data sheets will be filled out during Site-specific training and will be kept on the Site.

In the event of an incident where a team member becomes exposed or suffers from an acute symptom of exposure to site materials and has to be taken to a hospital, a copy of his/her medical data sheet will be presented to the attending physician.

Table 13-1
Emergency Telephone Numbers

Nearest Hospital:

North Shore University Hospital at Glen Cove
101 St. Andrews Lane
Glen Cove, NY 11542
(516) 674-7300

Contact	Firm or Agency	Telephone Number
Police		911
Fire		911
Ambulance		911
Project Manager/Health and Safety Manager	Derek Ersbak PWGC	(631) 589-6353
Health & Safety Officer	Amanda Racaniello PWGC	(631) 589-6353
NYSDEC Site Contact	Heidi-Marie Dudek	(518) 402-9813
USEPA Site Contact	Lorenzo Thantu	(212)-637-3966
New York Poison Control		(800)222-1222
Center for Disease Control		(800)311-3435

13.5 Emergency Medical Treatment

The procedures and rules in this HASP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to the FTL/SHSO immediately. First aid equipment will be available on Site at the following locations:

- First Aid Kit: Support Zone (or designated by FTL/SHSO upon arrival)
- Emergency Eye Wash: Support Zone (or designated by FTL/SHSO upon arrival)

During Site-specific training, project personnel will be informed of the location of the first aid station(s) that has been set up. Unless they are in immediate danger, severely injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate

treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, will be followed closely.

There will be at least two people with current First Aid and CPR certification on each active work shift. When personnel are transported to the hospital, the FTL/SHSO will provide a copy of the Medical Data Sheet to the paramedics and treating physician.

Only in non-emergency situations will an injured person be transported to the hospital by means other than an ambulance. **A map and directions to the hospital can be found in Appendix F.**

13.6 Emergency Site Evacuation Routes and Procedures

In order to mobilize the manpower resources and equipment necessary to cope with a fire or other emergency, a clear chain of authority will be established. The EC will take charge of all emergency response activities and dictate the procedures that will be followed for the duration of the emergency. The EC will report immediately to the scene of the emergency, assess the seriousness of the situation, and direct whatever efforts are necessary until the emergency response units arrive. At his/her discretion, the EC also may order the closure of the site for an indefinite period.

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs, including but not limited to fire, explosion or significant release of toxic gas into the atmosphere, an air horn will be sounded on the site. The horn will sound continuously for one blast, signaling that immediate evacuation of all personnel is necessary due to an immediate or impending danger. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at the evacuation meeting point, which will be determined upon arrival at the site by the FTL/SHSO, prior to work beginning. This will then be conveyed to all crew members during the site-specific briefing.

The EC will give directions for implementing whatever actions are necessary. Any project team member may be assigned to be in charge of emergency communications during an emergency. He/she will attend the Site telephone specified by the EC from the time the alarm sounds until the emergency has ended.

After sounding the alarm and initiating emergency response procedures, the EC will check and verify that access roads are not obstructed. If traffic control is necessary, as in the event of a fire or explosion, a project team

member, who has been trained in these procedures and designated at the site safety meeting, will take over these duties until local police and fire fighters arrive.

The EC will remain at the site to provide any assistance requested by emergency-response squads as they arrive to deal with the situation. A map showing evacuation routes, meeting places and the location of emergency equipment will be posted in all trailers and used during site-specific training.

13.7 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the site (air horn will sound for a single continuous blast), and notification of local fire and police departments. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

13.7.1 Fire Prevention

Adhering to the following precautions will prevent fires:

- Good housekeeping and storage of materials;
- Storage of flammable liquids and gases away from oxidizers;
- No smoking in the exclusion zone or any work area;
- No hot work without a properly executed hot work permit;
- Shutting off engines to refuel;
- Grounding and bonding metal containers during transfer of flammable liquids;
- Use of UL approved flammable storage cans;
- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers and near all hot work activities; and
- Monthly inspections of all fire extinguishers.

13.8 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Material Safety Data Sheet or recommended by the Corporate Medical Consultant will be followed, when necessary.

SKIN AND EYE CONTACT: Use copious amounts of soap and water. Wash/rinse affected areas thoroughly, and then provide appropriate medical attention. Eyes should be rinsed for 15 minutes upon chemical contamination. Skin should also be rinsed for 15 minutes if contact with caustics, acids or hydrogen peroxide occurs.

INHALATION: Move to fresh air. Decontaminate and transport to hospital or local medical provider.

INGESTION: Decontaminate and transport to emergency medical facility.

PUNCTURE WOUND OR LACERATION: Decontaminate and transport to emergency medical facility.

13.9 Decontamination during Medical Emergencies

If emergency life-saving first aid and/or medical treatment is required, normal decontamination procedures may need to be abbreviated or postponed. The FTL/SHSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on-site, a plastic barrier placed between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

13.10 Accident/Incident Reporting

As soon as first aid and/or emergency response needs have been met, the following parties are to be contacted by telephone:

- Health and Safety Manager;
- Project Manager; and
- The employer of any injured worker who is not a PWGC employee.

Written confirmation of verbal reports are to be completed by the FTL/SHSO using the Incident Report Form and submitted within 24 hours. The incident report and investigation form is found in **Appendix G**. If the employee involved is not a PWGC employee, his employer will receive a copy of the report.

13.11 Adverse Weather Conditions

In the event of adverse weather conditions, the FTL/SHSO will determine if work can continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries;
- Potential for cold stress and cold-related injuries;
- Treacherous weather-related working conditions (hail, rain, snow, ice, high winds);
- Limited visibility (fog);
- Potential for electrical storms;
- Earthquakes; and
- Other major incidents.

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The FTL/SHSO will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions.

13.12 Spill Control and Response

All small hazardous spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the MSDS will be consulted to assist in determining the best means of containment and cleanup. For small spills, sorbent materials such as sand, sawdust or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid spills should be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. Drains or drainage areas should be blocked. All spill containment materials will be properly disposed. An exclusion zone of 50 to 100 feet around the spill area should be established depending on the size of the spill. The following seven steps should be taken by the Emergency Coordinator:

- Determine the nature, identity and amounts of major spill components;
- Make sure all unnecessary persons are removed from the spill area;
- Notify appropriate response teams and authorities;
- Use proper PPE in consultation with the FTL/SHSO;
- If a flammable liquid, gas or vapor is involved, remove all ignition sources and use non-sparking and/or explosive proof equipment to contain or clean up the spill (diesel only vehicles, air operated pumps, etc.);
- If possible, try to stop the leak with appropriate material; and,
- Remove all surrounding materials that can react or compound with the spill.

13.13 Emergency Equipment

The following minimum emergency equipment shall be kept and maintained on-site:

- Industrial first aid kit;
- Burn kit and portable eye washes (one per field team);
- Fire extinguishers (one per work area); and
- Absorbent material /spill kit.

14.0 TRAINING

14.1 General Health and Safety Training

In accordance with PWGC corporate policy, and pursuant to 29 CFR 1910.120, hazardous waste site workers shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations unless otherwise noted in the above reference. At a minimum, the training shall have consisted of instruction in the topics outlined in the standard. Personnel who have not met the requirements for initial training shall not be allowed to work in any site activities in which they may be exposed to hazards (chemical or physical).

14.1.1 *Three Day Supervised On the Job Training*

In addition to the required initial hazardous waste operations training, each employee shall have received three days of directly supervised on-the-job training. This training will address the duties the employees are expected to perform.

14.2 Annual Eight-Hour Refresher Training

Annual eight-hour refresher training will be required of all hazardous waste site field personnel in order to maintain their qualifications for fieldwork. The training will cover a review of 1910.120 requirements and related company programs and procedures.

14.3 Site-Specific Training

Prior to commencement of field activities, all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the site operations. It will include site and facility layout, hazards and emergency services at the site, and will highlight all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity.

14.4 On-Site Safety Briefings

Project personnel and visitors will be given on-site health and safety briefings daily by the FTL/SHSO to assist site personnel in safely conducting their work activities. A copy of the Daily Briefing Sign-In Sheet is contained in **Appendix H**. The briefings will include information on new operations to be conducted, changes in work practices or changes in the site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity to periodically update the crews on monitoring results. Prior to starting any new

activity, a training session using the Activity Hazard Analysis will be held for crew members involved in the activity.

14.5 First Aid and CPR

The HSM will identify those individuals requiring first aid and CPR training to ensure that emergency medical treatment is available during field activities. It is anticipated that a minimum of one field person on-site at any one time will have first aid and CPR training. The training will be consistent with the requirements of the American Red Cross Association or American Heart Association. If none are available on-site, then the HSM shall be notified.

14.6 Supervisory Training

Supervisors and health and safety personnel shall have completed an additional eight hours of specialized training in accordance with 29 CFR 1910.120.

15.0 LOGS, REPORTS AND RECORDKEEPING

Changes to the HASP will be documented in the Health and Safety log book and as appropriate, the HSM and/or PM will be notified. Daily tailgate meetings will be documented in the H&S log book as well as personnel on-site.

15.1 Medical and Training Records

Copies or verification of training (40-hour, 8-hour, supervisor, site-specific training and documentation of three day OJT) and medical clearance for hazardous waste site work and respirator use will be maintained on-site. Records for all subcontractor employees will also be kept on-site.

15.2 Incident Report and Investigation Form

The incident report and investigation form is to be completed for all accidents and incidents, including near misses. The form can be found in **Appendix G**.

15.3 Health and Safety Logbooks

The FTL/SHSO will maintain a logbook during site work. The daily site conditions, personnel, monitoring results and significant events will be recorded. The original logbooks will become part of the exposure records file.

16.0 FIELD PERSONNEL REVIEW

This form serves as documentation that field personnel have read, or have been informed of, and understand the provisions of the HASP. It is maintained on site by the FTL/SHSO as a project record. Each field team member shall sign this section after site-specific training is completed and before being permitted to work on site.

I have read, or have been informed of, the Health and Safety Plan and understand the information presented. I will comply with the provisions contained therein.

Appendix A

Material Safety Data Sheets

ARSENIC

0013

October 1999

CAS No: 7440-38-2
RTECS No: CG0525000
UN No: 1558
EC No: 033-001-00-X

Grey arsenic
As
Atomic mass: 74.9

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames. NO contact with strong oxidizers. NO contact with hot surfaces.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Risk of fire and explosion is slight when exposed to hot surfaces or flames in the form of fine powder or dust.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	

EXPOSURE		PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!	IN ALL CASES CONSULT A DOCTOR!
Inhalation	Cough. Sore throat. Shortness of breath. Weakness. See Ingestion.	Closed system and ventilation.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
Skin	Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
Eyes	Redness.	Face shield or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Abdominal pain. Diarrhoea. Nausea. Vomiting. Burning sensation in the throat and chest. Shock or collapse. Unconsciousness.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Evacuate danger area! Sweep spilled substance into sealable containers. Carefully collect remainder, then remove to safe place. Chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment.	T Symbol N Symbol R: 23/25-50/53 S: (1/2-)20/21-28-45-60-61 UN Hazard Class: 6.1 UN Pack Group: II Do not transport with food and feedstuffs. Marine pollutant.

EMERGENCY RESPONSE	SAFE STORAGE
Transport Emergency Card: TEC (R)-61GT5-II	Separated from strong oxidants, acids, halogens, food and feedstuffs. Well closed.

IPCS

International
Programme on
Chemical Safety



Prepared in the context of cooperation between the International Programme on Chemical Safety and the European Commission ©
IPCS 2005

SEE IMPORTANT INFORMATION ON THE BACK.

IMPORTANT DATA

Physical State; Appearance

ODOURLESS, BRITTLE, GREY, METALLIC-LOOKING CRYSTALS.

Chemical dangers

Upon heating, toxic fumes are formed. Reacts violently with strong oxidants and halogens, causing fire and explosion hazard. Reacts with acids to produce toxic arsine gas (see: ICSC 0222).

Occupational exposure limits

TLV: 0.01 mg/m³ as TWA; A1 (confirmed human carcinogen); BEI issued; (ACGIH 2004).

MAK: Carcinogen category: 1; Germ cell mutagen group: 3A; (DFG 2004).

Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Inhalation risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly, when dispersed.

Effects of short-term exposure

The substance is irritating to the eyes, the skin and the respiratory tract. The substance may cause effects on the gastrointestinal tract, cardiovascular system, central nervous system and kidneys, resulting in severe gastroenteritis, loss of fluid, and electrolytes, cardiac disorders, shock, convulsions and kidney impairment. Exposure above the OEL may result in death. The effects may be delayed. Medical observation is indicated.

Effects of long-term or repeated exposure

Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the mucous membranes, skin, peripheral nervous system, liver and bone marrow, resulting in pigmentation disorders, hyperkeratosis, perforation of nasal septum, neuropathy, liver impairment, anaemia. This substance is carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Sublimation point: 613°C
Density: 5.7 g/cm³

Solubility in water: none

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms. It is strongly advised that this substance does not enter the environment.

NOTES

The substance is combustible but no flash point is available in literature.

Depending on the degree of exposure, periodic medical examination is suggested.

Do NOT take working clothes home.

Refer also to cards for specific arsenic compounds, e.g., Arsenic pentoxide (ICSC 0377), Arsenic trichloride (ICSC 0221), Arsenic trioxide (ICSC 0378), Arsine (ICSC 0222).

Card has been partly updated in October 2004. See sections Occupational Exposure Limits, EU classification, Emergency Response.

Card has been partly updated in October 2005 in section Effects of long-term or repeated exposure.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible for the use which might be made of this information

CAS No: 7440-39-3
 RTECS No: CQ8370000
 UN No: 1400

Ba
 Atomic mass: 137.3

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Flammable. Many reactions may cause fire or explosion.	NO open flames, NO sparks, and NO smoking. NO contact with water.	Special powder, dry sand, NO hydrous agents, NO water.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	

EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	
Inhalation	Cough. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
Eyes	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Sweep spilled substance into sealable containers. Carefully collect remainder, then remove to safe place. Chemical protection suit including self-contained breathing apparatus. Do NOT wash away into sewer.	UN Hazard Class: 4.3 UN Pack Group: II

EMERGENCY RESPONSE	STORAGE
Transport Emergency Card: TEC (R)-43G12	Separated from halogenated solvents, strong oxidants, acids. Dry. Keep under inert gas, oil or oxygen-free liquid.

IMPORTANT DATA

Physical State; Appearance

YELLOWISH TO WHITE LUSTROUS SOLID IN VARIOUS FORMS.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

The substance may spontaneously ignite on contact with air (if in powder form). The substance is a strong reducing agent and reacts violently with oxidants and acids. Reacts violently with halogenated solvents. Reacts with water, forming flammable/explosive gas (hydrogen - see ICSC 0001), causing fire and explosion hazard.

Occupational exposure limits

TLV: 0.5 mg/m³ (as TWA) (ACGIH 1999).

Routes of exposure

The substance can be absorbed into the body by ingestion.

Effects of short-term exposure

The substance irritates the eyes, the skin and the respiratory tract.

PHYSICAL PROPERTIES

Boiling point: 1640°C
Melting point: 725°C

Density: 3.6 g/cm³
Solubility in water: reaction

ENVIRONMENTAL DATA

NOTES

Reacts violently with fire extinguishing agents such as water, bicarbonate, powder, foam, and carbon dioxide.
Rinse contaminated clothes (fire hazard) with plenty of water.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible for the use which might be made of this information

BENZ(a)ANTHRACENE**0385**

October 1995

CAS No: 56-55-3

RTECS No: CV9275000

EC No: 601-033-00-9

1,2-Benzoanthracene

Benzo(a)anthracene

2,3-Benzphenanthrene

Naphthanthracene

C₁₈H₁₂

Molecular mass: 228.3

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Combustible.		Water spray, powder. In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	

EXPOSURE		AVOID ALL CONTACT!	
Inhalation		Local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Safety goggles, face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: complete protective clothing including self-contained breathing apparatus.	T Symbol N Symbol R: 45-50/53 S: 53-45-60-61

EMERGENCY RESPONSE	SAFE STORAGE
	Well closed.

IPCSInternational
Programme on
Chemical SafetyPrepared in the context of cooperation between the International
Programme on Chemical Safety and the European Commission ©
IPCS 2005**SEE IMPORTANT INFORMATION ON THE BACK.**

IMPORTANT DATA

Physical State; Appearance

COLOURLESS TO YELLOW - BROWN FLUORESCENT FLAKES OR POWDER.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Occupational exposure limits

TLV: A2 (suspected human carcinogen); (ACGIH 2004).

Routes of exposure

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Inhalation risk

Evaporation at 20/C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure

This substance is probably carcinogenic to humans.

PHYSICAL PROPERTIES

Sublimation point: 435/C
Melting point: 162/C
Relative density (water = 1): 1.274

Solubility in water: none
Vapour pressure, Pa at 20/C: 292
Octanol/water partition coefficient as log Pow: 5.61

ENVIRONMENTAL DATA

Bioaccumulation of this chemical may occur in seafood.

NOTES

This substance is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form.

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

Do NOT take working clothes home.

Tetraphene is a common name.

Card has been partly updated in October 2005. See sections Occupational Exposure Limits, EU classification.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible for the use which might be made of this information

BENZO(a)PYRENE**0104**

October 2005

CAS No: 50-32-8
RTECS No: DJ3675000
EC No: 601-032-00-3

Benz(a)pyrene
3,4-Benzopyrene
Benzo(d,e,f)chrysene
 $C_{20}H_{12}$
Molecular mass: 252.3

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, foam, powder, carbon dioxide.
EXPLOSION			

EXPOSURE	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
Inhalation		Local exhaust or breathing protection.	Fresh air, rest.
Skin	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion		Do not eat, drink, or smoke during work.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Evacuate danger area! Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	T Symbol N Symbol R: 45-46-60-61-43-50/53 S: 53-45-60-61

EMERGENCY RESPONSE	SAFE STORAGE
	Separated from strong oxidants.

IPCS

International
Programme on
Chemical Safety



Prepared in the context of cooperation between the International
Programme on Chemical Safety and the European Commission ©
IPCS 2005

SEE IMPORTANT INFORMATION ON THE BACK.

IMPORTANT DATA

Physical State; Appearance

PALE-YELLOW CRYSTALS

Chemical dangers

Reacts with strong oxidants causing fire and explosion hazard.

Occupational exposure limits

TLV: Exposure by all routes should be carefully controlled to levels as low as possible A2 (suspected human carcinogen); (ACGIH 2005).

MAK: Carcinogen category: 2; Germ cell mutagen group: 2; (DFG 2005).

Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.

Inhalation risk

Evaporation at 20/C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of long-term or repeated exposure

This substance is carcinogenic to humans. May cause heritable genetic damage to human germ cells. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 496/C
Melting point: 178.1/C
Density: 1.4 g/cm³Solubility in water: none (<0.1 g/100 ml)
Vapour pressure : negligible
Octanol/water partition coefficient as log Pow: 6.04

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. Bioaccumulation of this chemical may occur in fish, in plants and in molluscs. The substance may cause long-term effects in the aquatic environment.

NOTES

Do NOT take working clothes home.

Benzo(a)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAHs) in the environment, usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible for the use which might be made of this information

BENZO(b)FLUORANTHENE

0720

March 1999

CAS No: 205-99-2
RTECS No: CU1400000
EC No: 601-034-00-4

Benz(e)acephenanthrylene
2,3-Benzofluoroanthene
Benzo(e)fluoranthene
3,4-Benzofluoranthene
 $C_{20}H_{12}$
Molecular mass: 252.3

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			

EXPOSURE		AVOID ALL CONTACT!	
Inhalation		Local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	T Symbol N Symbol R: 45-50/53 S: 53-45-60-61

EMERGENCY RESPONSE	SAFE STORAGE
	Provision to contain effluent from fire extinguishing. Well closed.



IMPORTANT DATA

Physical State; Appearance

COLOURLESS CRYSTALS

Chemical dangers

Upon heating, toxic fumes are formed.

Occupational exposure limits

TLV: A2 (suspected human carcinogen); (ACGIH 2004).

MAK: Carcinogen category: 2; (DFG 2004).

Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

Inhalation risk

Evaporation at 20/C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure

This substance is possibly carcinogenic to humans. May cause genetic damage in humans.

PHYSICAL PROPERTIES

Boiling point: 481/C

Melting point: 168/C

Solubility in water: none

Octanol/water partition coefficient as log Pow: 6.12

ENVIRONMENTAL DATA

This substance may be hazardous to the environment; special attention should be given to air quality and water quality.

NOTES

Benzo(b)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco. ACGIH recommends environment containing benzo(b)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m³.

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

Card has been partly updated in October 2005. See section Occupational Exposure Limits.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible for the use which might be made of this information

BENZO(k)FLUORANTHENE**0721**

March 1999

CAS No: 207-08-9
RTECS No: DF6350000
EC No: 601-036-00-5

Dibenzo(b,jk)fluorene
8,9-Benzofluoranthene
11,12-Benzofluoranthene
 $C_{20}H_{12}$
Molecular mass: 252.3

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
Inhalation		Local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Safety spectacles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.
SPILLAGE DISPOSAL		PACKAGING & LABELLING	
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.		T Symbol N Symbol R: 45-50/53 S: 53-45-60-61	
EMERGENCY RESPONSE		SAFE STORAGE	
		Provision to contain effluent from fire extinguishing. Well closed.	

IPCS

International
Programme on
Chemical Safety



Prepared in the context of cooperation between the International
Programme on Chemical Safety and the European Commission ©
IPCS 2005

SEE IMPORTANT INFORMATION ON THE BACK.

IMPORTANT DATA

Physical State; Appearance

YELLOW CRYSTALS

Chemical dangers

Upon heating, toxic fumes are formed.

Occupational exposure limits

TLV not established.

MAK: Carcinogen category: 2; (DFG 2004).

Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

Inhalation risk

Evaporation at 20/C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure

This substance is possibly carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 480/C

Melting point: 217/C

Solubility in water: none

Octanol/water partition coefficient as log Pow: 6.84

ENVIRONMENTAL DATA

This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in crustacea and in fish.

NOTES

Benzo(k)fluoranthene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco. ACGIH recommends environment containing benzo(k)fluoranthene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m³.

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

Card has been partly updated in October 2005. See section Occupational Exposure Limits.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible for the use which might be made of this information

CADMIUM

0020
April 2005

CAS No: 7440-43-9
RTECS No: EU9800000
UN No: 2570
EC No: 048-002-00-0

Cd
Atomic mass: 112.4

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Flammable in powder form and spontaneously combustible in pyrophoric form. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames, NO sparks, and NO smoking. NO contact with heat or acid(s).	Dry sand. Special powder. NO other agents.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	

EXPOSURE		PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
Inhalation	Cough. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Abdominal pain. Diarrhoea. Headache. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Evacuate danger area! Personal protection: chemical protection suit including self-contained breathing apparatus. Remove all ignition sources. Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place.	T+ Symbol N Symbol R: 45-26-48/23/25-62-63-68-50/53 S: 53-45-60-61 Note: E UN Hazard Class: 6.1 Airtight. Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.

EMERGENCY RESPONSE	SAFE STORAGE
	Fireproof. Dry. Keep under inert gas. Separated from ignition sources, oxidants acids, food and feedstuffs.

IMPORTANT DATA

Physical State; Appearance

SOFT BLUE-WHITE METAL LUMPS OR GREY POWDER.
MALLEABLE. TURNS BRITTLE ON EXPOSURE TO 80/C AND
TARNISHES ON EXPOSURE TO MOIST AIR.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

Reacts with acids forming flammable/explosive gas (hydrogen - see ICSC0001). Dust reacts with oxidants, hydrogen azide, zinc, selenium or tellurium, causing fire and explosion hazard.

Occupational exposure limits

TLV: (Total dust) 0.01 mg/m³; (Respirable fraction) 0.002 mg/m³; as TWA; A2 (suspected human carcinogen); BEI issued; (ACGIH 2005).

MAK: skin absorption (H); Carcinogen category: 1; Germ cell mutagen group: 3A; (DFG 2004).

Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

Effects of short-term exposure

The fume is irritating to the respiratory tract. Inhalation of fume may cause lung oedema (see Notes). Inhalation of fumes may cause metal fume fever. The effects may be delayed. Medical observation is indicated.

Effects of long-term or repeated exposure

Lungs may be affected by repeated or prolonged exposure to dust particles. The substance may have effects on the kidneys, resulting in kidney impairment. This substance is carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 765/C
Melting point: 321/C
Density: 8.6 g/cm³

Solubility in water: none
Auto-ignition temperature: (cadmium metal dust) 250/C

ENVIRONMENTAL DATA

NOTES

Reacts violently with fire extinguishing agents such as water, foam, carbon dioxide and halons.

Depending on the degree of exposure, periodic medical examination is indicated.

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential.

Do NOT take working clothes home.

Cadmium also exists in a pyrophoric form (EC No. 048-011-00-X), which bears the additional EU labelling symbol F, R phrase 17, and S phrases 7/8 and 43. UN numbers and packing group will vary according to the physical form of the substance.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible

Safety (MSDS) data for chrysene



General

Synonyms: 1,2-benzophenanthrene, benzo(a)phenanthrene, 1,2-benzphenanthrene, coal tar pitch, benz(a)phenanthrene, 1,2,5,6-dibenzonaphthalene

Molecular formula: $C_{18}H_{12}$

CAS No: 218-01-9

EC No: 205-923-4

Physical data

Appearance: crystalline powder

Melting point: 253 C

Boiling point: 448 C

Vapour density:

Vapour pressure:

Density ($g\ cm^{-3}$): 1.27

Flash point:

Explosion limits:

Autoignition temperature:

Water solubility: insoluble

Stability

Stable. Combustible. Incompatible with strong oxidizing agents.

Toxicology

Toxic. Confirmed animal carcinogen, possible human carcinogen. Harmful if

swallowed, inhaled or absorbed through the skin.

Toxicity data

(The meaning of any abbreviations which appear in this section is given [here](#).)

IPR-MUS LD50 >320 mg kg⁻¹

Risk phrases

(The meaning of any risk phrases which appear in this section is given [here](#).)

R20 R21 R22 R45 R46.

Transport information

(The meaning of any UN hazard codes which appear in this section is given [here](#).)

UN No 2811. Packing group I. Hazard class 6.1. CDG UK Transport category 1. EMS No 6.1-04.

Personal protection

Safety glasses, good ventilation, gloves. Handle as a carcinogen. A COSHH assessment is required.

Safety phrases

(The meaning of any safety phrases which appear in this section is given [here](#).)

S3 S7 S9 S36 S37 S39 S45.

[Return to [Physical & Theoretical Chemistry Lab. Safety home page](#).]

This information was last updated on April 1, 2005. We have tried to make it as accurate and useful as possible, but can take no responsibility for its use, misuse, or accuracy. We have not verified this information, and cannot guarantee that it is up-to-date.

COPPER

0240

September 1993

CAS No: 7440-50-8
RTECS No: GL5325000
UN No:
EC No:

Cu
Atomic mass: 63.5

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Special powder, dry sand, NO other agents.
EXPLOSION			

EXPOSURE		PREVENT DISPERSION OF DUST!	
Inhalation	Cough. Headache. Shortness of breath. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL

Sweep spilled substance into containers. Carefully collect remainder. Then remove to safe place (extra personal protection: P2 filter respirator for harmful particles).

PACKAGING & LABELLING

Symbol
R:
S:

EMERGENCY RESPONSE

STORAGE

Separated from: see Chemical Dangers.

IPCS

International
Programme on
Chemical Safety



Prepared in the context of cooperation between the International
Programme on Chemical Safety and the European Commission
© IPCS 1999

SEE IMPORTANT INFORMATION ON THE BACK.

IMPORTANT DATA

Physical State; Appearance

RED POWDER, TURNS GREEN ON EXPOSURE TO MOIST AIR.

Chemical Dangers

Shock-sensitive compounds are formed with acetylenic compounds, ethylene oxides and azides. Reacts with strong oxidants like chlorates, bromates and iodates, causing explosion hazard.

Occupational Exposure Limits

TLV: ppm; 0.2 mg/m³ fume (ACGIH 1992-1993).
TLV (as Cu, dusts & mists): ppm; 1 mg/m³ (ACGIH 1992-1993).

Routes of Exposure

The substance can be absorbed into the body by inhalation and by ingestion.

Inhalation Risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of Short-term Exposure

Inhalation of fume may cause metal fever (see Notes).

Effects of Long-term or Repeated Exposure

Repeated or prolonged contact may cause skin sensitization.

PHYSICAL PROPERTIES

Boiling point: 2595°C
Melting point: 1083°C

Relative density (water = 1): 8.9
Solubility in water: none

ENVIRONMENTAL DATA

NOTES

The symptoms of metal fume fever do not become manifest until several hours.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible for the use which might be made of this information

DIBENZO(a,h)ANTHRACENE**0431**

October 1995

CAS No: 53-70-3

RTECS No: HN2625000

EC No: 601-041-00-2

1,2:5,6-Dibenzanthracene

C₂₂H₁₄

Molecular mass: 278.4

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
Inhalation		Local exhaust or breathing protection.	Fresh air, rest.
Skin	Redness. Swelling. Itching.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL

Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.
Personal protection: P3 filter respirator for toxic particles.

PACKAGING & LABELLING

T Symbol
N Symbol
R: 45-50/53
S: 53-45-60-61

EMERGENCY RESPONSE**SAFE STORAGE**

Well closed.

IPCS

International
Programme on
Chemical Safety



Prepared in the context of cooperation between the International
Programme on Chemical Safety and the European Commission ©
IPCS 2005

SEE IMPORTANT INFORMATION ON THE BACK.

IMPORTANT DATA

Physical State; Appearance

COLOURLESS CRYSTALLINE POWDER.

Occupational exposure limits

TLV not established.

Routes of exposure

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Inhalation risk

Evaporation at 20/C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure

The substance may have effects on the skin, resulting in photosensitization. This substance is probably carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 524/C

Melting point: 267/C

Relative density (water = 1): 1.28

Solubility in water: none

Octanol/water partition coefficient as log Pow: 6.5

ENVIRONMENTAL DATA

Bioaccumulation of this chemical may occur in seafood.

NOTES

This is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form.

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

Do NOT take working clothes home.

DBA is a commonly used name.

This substance is one of many polycyclic aromatic hydrocarbons (PAH).

Card has been partly updated in October 2005. See section EU classification.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible for the use which might be made of this information

CAS No: 60-57-1

RTECS No: IO1750000

UN No: 2761

EC No: 602-049-00-9

1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo-1,4-exo-5,8-dimethanonaphthalene
 3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-,
 (1aalpha,2beta,2aalpha,3beta,6beta,6aalpha,7beta,7aalpha)-2,7:3,6-dimethanonaphth(2,3-b)oxirene

HEOD

 $C_{12}H_8Cl_6O$

Molecular mass: 380.9

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Not combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			

EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	
Inhalation	(see Ingestion).	Ventilation (not if powder).	Fresh air, rest. Refer for medical attention.
Skin	MAY BE ABSORBED! See Ingestion.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
Eyes		Safety goggles, or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Convulsions. Dizziness. Headache. Nausea. Vomiting. Muscle twitching.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Do NOT wash away into sewer. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place (extra personal protection: chemical protection suit including self-contained breathing apparatus).	T+ Symbol N Symbol R: 25-27-40-48/25-50/53 S: (1/2-)22-36/37-45-60-61 UN Hazard Class: 6.1 UN Pack Group: II Do not transport with food and feedstuffs. Severe marine pollutant.

EMERGENCY RESPONSE	STORAGE
Transport Emergency Card: TEC (R)-61G41b.	Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs and incompatible materials: See Chemical Dangers. Well closed. Keep in a well-ventilated room.

IMPORTANT DATA

Physical State; Appearance

COLOURLESS CRYSTALS

Chemical Dangers

The substance decomposes on heating producing toxic fumes including hydrogen chloride. Reacts with oxidants and acids. Attacks metal due to the slow formation of hydrogen chloride in storage.

Occupational Exposure LimitsTLV (as TWA): 0.25 mg/m³, A4 (skin) (ACGIH 1997).**Routes of Exposure**

The substance can be absorbed into the body through the skin and by ingestion.

Inhalation Risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.

Effects of Short-term Exposure

The substance may cause effects on the central nervous system, resulting in convulsions. Medical observation is indicated.

Effects of Long-term or Repeated Exposure

The substance accumulates in the human body. Cumulative effects are possible: see acute hazards/symptoms.

PHYSICAL PROPERTIES

Melting point: 175-176°C

Density: 1.7 g/cm³

Solubility in water: none

Vapour pressure, Pa at 20°C: 0.0004

Octanol/water partition coefficient as log Pow: 6.2

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment; special attention should be given to honey bees, birds. In the food chain important to humans, bioaccumulation takes place, specifically in aquatic organisms. It is strongly advised not to let the chemical enter into the environment because it persists in the environment. The substance may cause long-term effects in the aquatic environment. Avoid release to the environment in circumstances different to normal use.

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s). Carrier solvents used in commercial formulations may change physical and toxicological properties. Do NOT take working clothes home. Alvit, Dioldrex, Dioldrite, Illoxol, Octalox, Panoram, and Quintox are trade names. Also consult ICSC #0774, Aldrin.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible for the use which might be made of this information

INDENO(1,2,3-cd)PYRENE**0730**

March 1999

CAS No: 193-39-5
RTECS No: NK9300000o-Phenylenepyrene
2,3-Phenylenepyrene
 $C_{22}H_{12}$
Molecular mass: 276.3

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE			In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			

EXPOSURE		AVOID ALL CONTACT!	
Inhalation		Local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	

EMERGENCY RESPONSE	SAFE STORAGE
	Provision to contain effluent from fire extinguishing. Well closed.

IPCSInternational
Programme on
Chemical SafetyPrepared in the context of cooperation between the International
Programme on Chemical Safety and the European Commission ©
IPCS 2005**SEE IMPORTANT INFORMATION ON THE BACK.**

IMPORTANT DATA

Physical State; Appearance

YELLOW CRYSTALS

Chemical dangers

Upon heating, toxic fumes are formed.

Occupational exposure limits

TLV not established.

MAK: Carcinogen category: 2; (DFG 2004).

Routes of exposure

The substance can be absorbed into the body by inhalation of its aerosol and through the skin.

Inhalation risk

Evaporation at 20/C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

Effects of long-term or repeated exposure

This substance is possibly carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 536/C

Melting point: 164/C

Solubility in water: none

Octanol/water partition coefficient as log Pow: 6.58

ENVIRONMENTAL DATA

This substance may be hazardous to the environment; special attention should be given to air quality and water quality. Bioaccumulation of this chemical may occur in fish.

NOTES

Indeno(1,2,3-cd)pyrene is present as a component of polycyclic aromatic hydrocarbons (PAH) content in the environment usually resulting from the incomplete combustion or pyrolysis of organic matters, especially fossil fuels and tobacco. ACGIH recommends environment containing Indeno(1,2,3-c,d)pyrene should be evaluated in terms of the TLV-TWA for coal tar pitch volatile, as benzene soluble 0.2 mg/m³.

Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken.

Card has been partly updated in October 2005. See section Occupational Exposure Limits.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible for the use which might be made of this information

CAS No: 7439-92-1
RTECS No: OF7525000

Lead metal
Plumbum
(powder)
Pb
Atomic mass: 207.2

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	

EXPOSURE	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	PREVENT DISPERSION OF DUST! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
Inhalation		Local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give plenty of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment. Personal protection: P3 filter respirator for toxic particles.	

EMERGENCY RESPONSE	SAFE STORAGE
	Separated from food and feedstuffs and incompatible materials. See Chemical Dangers.

IMPORTANT DATA

Physical State; Appearance

BLUISH-WHITE OR SILVERY-GREY SOLID IN VARIOUS FORMS. TURNS TARNISHED ON EXPOSURE TO AIR.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

On heating, toxic fumes are formed. Reacts with oxidants. Reacts with hot concentrated nitric acid, boiling concentrated hydrochloric acid and sulfuric acid. Attacked by pure water and by weak organic acids in the presence of oxygen.

Occupational exposure limits

TLV: 0.05 mg/m³ as TWA; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued; (ACGIH 2004). MAK: Carcinogen category: 3B; Germ cell mutagen group: 3A; (DFG 2004). EU OEL: as TWA 0.15 mg/m³; (EU 2002).

Routes of exposure

The substance can be absorbed into the body by inhalation and by ingestion.

Inhalation risk

A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

Effects of long-term or repeated exposure

The substance may have effects on the blood, bone marrow, central nervous system, peripheral nervous system and kidneys, resulting in anaemia, encephalopathy (e.g., convulsions), peripheral nerve disease, abdominal cramps and kidney impairment. Causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 1740/C
Melting point: 327.5/C

Density: 11.34 g/cm³
Solubility in water: none

ENVIRONMENTAL DATA

Bioaccumulation of this chemical may occur in plants and in mammals. It is strongly advised that this substance does not enter the environment.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Do NOT take working clothes home.
Card has been partly updated in April 2005. See section Occupational Exposure Limits.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible

MERCURY

0056
April 2004

CAS No: 7439-97-6
RTECS No: OV4550000
UN No: 2809
EC No: 080-001-00-0

Quicksilver
Liquid silver
Hg
Atomic mass: 200.6

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Risk of fire and explosion.		In case of fire: keep drums, etc., cool by spraying with water.

EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	IN ALL CASES CONSULT A DOCTOR!
Inhalation	Abdominal pain. Cough. Diarrhoea. Shortness of breath. Vomiting. Fever or elevated body temperature.	Local exhaust or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
Skin	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
Eyes		Face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion		Do not eat, drink, or smoke during work. Wash hands before eating.	Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Evacuate danger area in case of a large spill! Consult an expert! Ventilation. Collect leaking and spilled liquid in sealable non-metallic containers as far as possible. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Chemical protection suit including self-contained breathing apparatus.	T Symbol N Symbol R: 23-33-50/53 S: (1/2-)7-45-60-61 UN Hazard Class: 8 UN Pack Group: III Special material. Do not transport with food and feedstuffs.

EMERGENCY RESPONSE	STORAGE
Transport Emergency Card: TEC (R)-80GC9-II+III	Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Well closed.

IMPORTANT DATA

Physical State; Appearance

ODOURLESS, HEAVY AND MOBILE SILVERY LIQUID METAL.

Chemical dangers

Upon heating, toxic fumes are formed. Reacts violently with ammonia and halogens causing fire and explosion hazard. Attacks aluminium and many other metals forming amalgams.

Occupational exposure limits

TLV: 0.025 mg/m³ as TWA; (skin); A4; BEI issued; (ACGIH 2004).
MAK: 0.1 mg/m³; Sh; Peak limitation category: II(8); Carcinogen category: 3B; (DFG 2003).

Routes of exposure

The substance can be absorbed into the body by inhalation of its vapour and through the skin, also as a vapour!

Inhalation risk

A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20/C.

Effects of short-term exposure

The substance is irritating to the skin. Inhalation of the vapours may cause pneumonitis. The substance may cause effects on the central nervous system and kidneys. The effects may be delayed. Medical observation is indicated.

Effects of long-term or repeated exposure

The substance may have effects on the central nervous system and kidneys, resulting in irritability, emotional instability, tremor, mental and memory disturbances, speech disorders. May cause inflammation and discoloration of the gums. Danger of cumulative effects. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

PHYSICAL PROPERTIES

Boiling point: 357/C
Melting point: -39/C
Relative density (water = 1): 13.5
Solubility in water: none

Vapour pressure, Pa at 20/C: 0.26
Relative vapour density (air = 1): 6.93
Relative density of the vapour/air-mixture at 20/C (air = 1): 1.009

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. In the food chain important to humans, bioaccumulation takes place, specifically in fish.

NOTES

Depending on the degree of exposure, periodic medical examination is indicated.
No odour warning if toxic concentrations are present.
Do NOT take working clothes home.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible

CAS No: 7440-02-0
 RTECS No: QR5950000
 EC No: 028-002-00-7

(powder)
 Ni
 Atomic mass: 58.7

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Flammable as dust. Toxic fumes may be released in a fire.		Dry sand. NO carbon dioxide. NO water.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	

EXPOSURE		PREVENT DISPERSION OF DUST! AVOID ALL CONTACT!	
Inhalation	Cough. Shortness of breath.	Local exhaust or breathing protection.	Fresh air, rest.
Skin		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes		Safety spectacles, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Vacuum spilled material. Carefully collect remainder, then remove to safe place. Personal protection: P2 filter respirator for harmful particles.	Xn Symbol R: 40-43 S: (2-)22-36

EMERGENCY RESPONSE	SAFE STORAGE
	Separated from strong acids.

IMPORTANT DATA

Physical State; Appearance

SILVERY METALLIC SOLID IN VARIOUS FORMS.

Physical dangers

Dust explosion possible if in powder or granular form, mixed with air.

Chemical dangers

Reacts violently, in powder form, with titanium powder and potassium perchlorate, and oxidants such as ammonium nitrate, causing fire and explosion hazard. Reacts slowly with non-oxidizing acids and more rapidly with oxidizing acids. Toxic gases and vapours (such as nickel carbonyl) may be released in a fire involving nickel.

Occupational exposure limits

TLV: (Inhalable fraction) 1.5 mg/m³ as TWA; A5 (not suspected as a human carcinogen); (ACGIH 2004).

MAK: (Inhalable fraction); sensitization of respiratory tract and skin (Sah); Carcinogen category: 1; (DFG 2004).

Routes of exposure

The substance can be absorbed into the body by inhalation of the dust.

Inhalation risk

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of short-term exposure

May cause mechanical irritation. Inhalation of fumes may cause pneumonitis.

Effects of long-term or repeated exposure

Repeated or prolonged contact may cause skin sensitization. Repeated or prolonged inhalation exposure may cause asthma. Lungs may be affected by repeated or prolonged exposure. This substance is possibly carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 2730°C
Melting point: 1455°C

Density: 8.9 g/cm³
Solubility in water: none

ENVIRONMENTAL DATA

NOTES

At high temperatures, nickel oxide fumes will be formed.
Depending on the degree of exposure, periodic medical examination is suggested.
The symptoms of asthma often do not become manifest until a few hours have passed and they are aggravated by physical effort.
Rest and medical observation are therefore essential.
Anyone who has shown symptoms of asthma due to this substance should avoid all further contact with this substance.
Card has been partly updated in April 2005. See section Occupational Exposure Limits.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible

CAS No: 108-88-3
 RTECS No: XS5250000
 UN No: 1294
 EC No: 601-021-00-3

Methylbenzene
 Toluol
 Phenylmethane
 $C_6H_5CH_3$ / C_7H_8
 Molecular mass: 92.1

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	In case of fire: keep drums, etc., cool by spraying with water.

EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
Inhalation	Cough. Sore throat. Dizziness. Drowsiness. Headache. Nausea. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
Eyes	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Evacuate danger area in large spill! Consult an expert in large spill! Remove all ignition sources. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: self-contained breathing apparatus in large spill.	F Symbol Xn Symbol R: 11-38-48/20-63-65-67 S: (2-)36/37-46-62 UN Hazard Class: 3 UN Pack Group: II

EMERGENCY RESPONSE	SAFE STORAGE
Transport Emergency Card: TEC (R)-30S1294 NFPA Code: H 2; F 3; R 0	Fireproof. Separated from strong oxidants.

IMPORTANT DATA

Physical State; Appearance

COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

Physical dangers

The vapour mixes well with air, explosive mixtures are formed easily. As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Reacts violently with strong oxidants causing fire and explosion hazard.

Occupational exposure limits

TLV: 50 ppm as TWA; (skin); A4; BEI issued; (ACGIH 2004).
MAK: 50 ppm, 190 mg/m³; H; Peak limitation category: II(4);
Pregnancy risk group: C; (DFG 2004).

Routes of exposure

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Inhalation risk

A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20/C.

Effects of short-term exposure

The substance is irritating to the eyes and the respiratory tract. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure at high levels may result in cardiac dysrhythmia and unconsciousness.

Effects of long-term or repeated exposure

The liquid defats the skin. The substance may have effects on the central nervous system. Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 111/C
Melting point: -95/C
Relative density (water = 1): 0.87
Solubility in water: none
Vapour pressure, kPa at 25/C: 3.8
Relative vapour density (air = 1): 3.1

Relative density of the vapour/air-mixture at 20/C (air = 1): 1.01
Flash point: 4/C c.c.
Auto-ignition temperature: 480/C
Explosive limits, vol% in air: 1.1-7.1
Octanol/water partition coefficient as log Pow: 2.69

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested.
Use of alcoholic beverages enhances the harmful effect.
Card has been partly updated in October 2004. See sections Occupational Exposure Limits, EU classification, Emergency Response.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible

CAS No: 106-42-3
 RTECS No: ZE2625000
 UN No: 1307
 EC No: 601-022-00-9

para-Xylene
 1,4-Dimethylbenzene
 p-Xylol
 $C_6H_4(CH_3)_2$ / C_8H_{10}
 Molecular mass: 106.2

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/SYMPTOMS	PREVENTION	FIRST AID/FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 27/C explosive vapour/air mixtures may be formed.	Above 27/C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
Inhalation	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
Skin	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
Eyes	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.
SPILLAGE DISPOSAL		PACKAGING & LABELLING	
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)		EU classification Xn Symbol R: 10-20/21-38 S: (2-)25 Note: C UN classification UN Hazard Class: 3 UN Pack Group: III	
EMERGENCY RESPONSE		SAFE STORAGE	
Transport Emergency Card: TEC (R)-30S1307-III NFPA Code: H 2; F 3; R 0		Fireproof. Separated from strong oxidants, and strong acids.	

IMPORTANT DATA

Physical State; Appearance

COLOURLESS LIQUID, WITH CHARACTERISTIC ODOUR.

Physical dangers

As a result of flow, agitation, etc., electrostatic charges can be generated.

Chemical dangers

Reacts with strong acids and strong oxidants.

Occupational exposure limits

TLV: 100 ppm as TWA; 150 ppm as STEL A4 (ACGIH 2001). BEI specified by (ACGIH 2001).

MAK: 100 ppm, 440 mg/m³. Peak limitation category: II(2) skin absorption (H); Pregnancy risk group: D (DFG 2005).

EU OEL: 50 ppm as TWA; 100 ppm as STEL (skin) (EU 2000).

Routes of exposure

The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

Inhalation risk

A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20/C.

Effects of short-term exposure

The substance is irritating to the eyes and the skin. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

Effects of long-term or repeated exposure

The liquid defats the skin. The substance may have effects on the central nervous system. Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 138/C

Melting point: 13/C

Relative density (water = 1): 0.86

Solubility in water: none

Vapour pressure, kPa at 20/C: 0.9

Relative vapour density (air = 1): 3.7

Relative density of the vapour/air-mixture at 20/C (air = 1): 1.02

Flash point: 27/C c.c.

Auto-ignition temperature: 528/C

Explosive limits, vol% in air: 1.1-7.0

Octanol/water partition coefficient as log Pow: 3.15

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is indicated.

The recommendations on this Card also apply to technical xylene.

See ICSC 0084 o-Xylene and 0085 m-Xylene.

ADDITIONAL INFORMATION

LEGAL NOTICE

Neither the EC nor the IPCS nor any person acting on behalf of the EC or the IPCS is responsible for the use which might be made of this information

Appendix B

Activity Hazard Analyses

Project Identification Garvies Point Waterfront Revitalization Project	Location Various	Estimated Dates TBD
Phase of Work Mobilization/ Demobilization	Page 1 of 1	Analysis Approved by Paul Boyce, PE, PM/HSM
TASKS	HAZARDS	CONTROL MEASURES
1. Mobilization and demobilization of equipment site tools, personnel	Slips/trips/falls	<ul style="list-style-type: none"> • Maintain alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Walk, do not run; • Wear footwear with soles that grip; • Unloading areas should be on even terrain; and • Mark and repair if possible tripping hazards.
	Manual lifting and material handling	<ul style="list-style-type: none"> • Instruct personnel on proper lifting techniques; • Use proper lifting techniques; and • Team lifting will be used for heavy loads or use mechanical lifting devices.
	Temperature extremes	<ul style="list-style-type: none"> • Drink plenty of fluids; • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; and • Stay in visual and verbal contact with your buddy.
	Vehicular traffic	<ul style="list-style-type: none"> • Spotters will be used when backing up trucks and heavy equipment and when moving equipment.
	Overhead hazards	<ul style="list-style-type: none"> • Personnel will be required to wear hard hats that meet ANSI Standard Z89.1; • Ground personnel will stay clear of suspended loads; • Equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects; and • Overhead hazards will be identified prior to commencing work operations.
	Noise	<ul style="list-style-type: none"> • Ear plugs or ear muffs shall be worn for operations that exceed 85 decibels.
	Electrocution	<ul style="list-style-type: none"> • Equipment will be equipped with GFCI; • A licensed electrician will conduct electrical work; • Equipment will stay a minimum of 15 feet from overhead-energized electrical lines and the electrified third rail (up to 50 kV). This distance will increase 0.4 inches for each 1 kV above 50 kV.
	Biological hazards	<ul style="list-style-type: none"> • Be alert to the presence of biological hazards; • Wear insect repellent; • Follow procedures in Section 4.2.2 for tick bites; • FTL/SHSO should be aware of on-site personnel with allergic reactions in insect bites and stings.

Project Identification Garvies Point Waterfront Revitalization Project	Location Various	Estimated Dates TBD
Phase of Work Excavation	Page 1 of 1	Analysis Approved by Paul Boyce, PE, PM/HSM
TASKS	HAZARDS	CONTROL MEASURES
1. Excavate to required depths; soil handling and transport	Chemical hazards	<ul style="list-style-type: none"> Wear appropriate PPE per Table 6-1; Perform air monitoring per Community Air Monitoring Plan; Practice contamination avoidance; Follow proper decontamination procedures; and Wash hands/face before eating, drinking or smoking.
	Hand and power tool usage	<ul style="list-style-type: none"> Equip electrical equipment with GFCI's; Inspect electrical equipment and tools prior to use; Daily inspections will be performed; Remove broken or damaged tools from service; Use the tool for its intended purpose; Use in accordance with manufacturer instructions; and Tag and remove defective equipment.
	Temperature extremes	<ul style="list-style-type: none"> Drink plenty of fluids; Train personnel of signs/symptoms of heat/cold stress; Monitor air temperatures when extreme weather conditions are present; and, Stay in visual and verbal contact with your buddy.
	Manual lifting and material handling	<ul style="list-style-type: none"> Instruct personnel on proper lifting techniques; Use proper lifting techniques; and Team lifting will be used for heavy loads or use mechanical lifting devices.
	Fire/Explosion	<ul style="list-style-type: none"> ABC type fire extinguishers shall be readily available; No smoking in work area.
	Biological hazards	<ul style="list-style-type: none"> Be alert to the presence of biological hazards; Wear insect repellent; Follow procedures in Section 4.2.2 for tick bites; FTL/SHSO should be aware of on-site personnel with allergic reactions in insect bites and stings.
	Heavy equipment	<ul style="list-style-type: none"> Ground personnel will stay clear of suspended loads; Ground personnel will stay out of the swing radius; Eye contact with operators will be made before approaching equipment; Equipment will not be approached on blind sides; Equipment will be equipped with backup alarms or spotters shall be used.
	Slips/Trips/Falls	<ul style="list-style-type: none"> Maintain alertness to slip/trip/fall hazards; Maintain good housekeeping; Walk, do not run; Wear footwear with soles that grip; Unloading areas should be on even terrain; and mark and repair if possible tripping hazards are present.
	Electrocution	<ul style="list-style-type: none"> Equipment will be equipped with GFCI; A licensed electrician will conduct electrical work; Equipment will stay a minimum of 15 feet from overhead-energized electrical lines and the electrified third rail (up to 50 kV). This distance will increase 0.4 inches for each 1 kV above 50 kV.

Project Identification Garvies Point Waterfront Revitalization Project	Location Various	Estimated Dates TBD
Phase of Work Soil Sampling	Page 1 of 1	Analysis Approved by Paul Boyce, PE, PM/HSM
TASKS	HAZARDS	CONTROL MEASURES
1. Collect soil samples.	Chemical hazards	<ul style="list-style-type: none"> Wear appropriate PPE per Table 6-1; Practice contamination avoidance; Follow proper decontamination procedures; and Wash hands/face before eating, drinking or smoking.
	Temperature extremes	<ul style="list-style-type: none"> Drink plenty of fluids; Train personnel of signs/symptoms of heat/cold stress; Monitor air temperatures when extreme weather conditions are present; and Stay in visual and verbal contact with your buddy.
	Manual lifting and material handling	<ul style="list-style-type: none"> Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.
	Slips/Trips/Falls	<ul style="list-style-type: none"> Maintain alertness to slip/trip/fall hazards; Maintain good housekeeping; Walk, do not run; Wear footwear with soles that grip; Unloading areas should be on even terrain; and Mark and repair if possible tripping hazards.
	Electrocution	<ul style="list-style-type: none"> Equipment will be equipped with GFCI; A licensed electrician will conduct electrical work; Equipment will stay a minimum of 15 feet from overhead-energized electrical lines and the electrified third rail (up to 50 kV). This distance will increase 0.4 inches for each 1 kV above 50 kV.
	Track Hazards	<ul style="list-style-type: none"> Caution will be used when working in close proximity to the electrified third rail (see "Electrocution" above). Workers are required to have completed NYCT Track Safety Training Flag men will be used when necessary (e.g., working in limited access track areas).

Project Identification Garvies Point Waterfront Revitalization Project	Location Various	Estimated Dates TBD
Phase of Work Decontamination	Page 1 of 1	Analysis Approved by Paul Boyce, PE, PM/HSM
TASKS	HAZARDS	CONTROL MEASURES
1.Decontaminate equipment	Chemical hazards	<ul style="list-style-type: none"> • Wear appropriate PPE per Table 6-1; • Practice contamination avoidance; • Follow proper decontamination procedures; and • Wash hands/face before eating, drinking or smoking.
	Temperature extremes	<ul style="list-style-type: none"> • Drink plenty of fluids; • Train personnel of signs/symptoms of heat/cold stress; • Monitor air temperatures when extreme weather conditions are present; and • Stay in visual and verbal contact with your buddy.
	Manual lifting and material handling	<ul style="list-style-type: none"> • Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.
	Slips/Trips/Falls	<ul style="list-style-type: none"> • Maintain alertness to slip/trip/fall hazards; • Maintain good housekeeping; • Walk, do not run; • Wear footwear with soles that grip; • Unloading areas should be on even terrain; and • Mark and repair if possible tripping hazards.
	Electrocution	<ul style="list-style-type: none"> • Equipment will be equipped with GFCI; • A licensed electrician will conduct electrical work; • Equipment will stay a minimum of 15 feet from overhead-energized electrical lines and the electrified third rail (up to 50 kV). This distance will increase 0.4 inches for each 1 kV above 50 kV.
	Track Hazards	<ul style="list-style-type: none"> • Caution will be used when working in close proximity to the electrified third rail (see "Electrocution" above). • Workers are required to have completed NYCT Track Safety Training • Flag men will be used when necessary (e.g., working in limited access track areas).

Appendix C

Heat/Cold Stress Protocols

HEAT STRESS

Heat Stress (Hyperthermia)

Heat stress is the body's inability to regulate the core temperature. A worker's susceptibility to heat stress can vary according to his/her physical fitness, degree of acclimation to heat, humidity, age and diet.

1. Prior to site activity, the field team leader may make arrangements for heat stress monitoring (i.e., monitoring heart rate, body temperature, and body water loss) during actual site work if conditions warrant. In addition, the FTL is to ensure that each team member has been acclimatized to the prevailing environmental conditions, that personnel are aware of the signs and symptoms of heat sickness, that they have been adequately trained in first aid procedures, and that there are enough personnel on-site to rotate work assignments and schedule work during hours of reduced temperatures. Personnel should not consume alcoholic or caffeinated beverages but rather drink moderate levels of an electrolyte solution and eat well prior to commencing site work.
2. Although there is no specific test given during a baseline physical that would identify a person's intolerance to heat, some indicators are tobacco or medication use, dietary habits, body weight, and chronic conditions such as high blood pressure or diabetes.
3. *Heat cramps*, caused by profuse perspiration with inadequate fluid intake and salt replacement, most often afflict people in good physical condition who work in high temperature and humidity. Heat cramps usually come on suddenly during vigorous activity. Untreated, heat cramps may progress rapidly to heat exhaustion or heat stroke. First aid treatment: remove victim to a cool place and replace lost fluids with water.
4. Thirst is not an adequate indicator of heat exposure. Drinking fluid by itself does not indicate sufficient water replacement during heat exposure. A general rule, the amount of water administered should replace the amount of water lost, and it should be administered at regular intervals throughout the day. For every half pound of water lost, 8 ounces of water should be ingested. Water should be replaced by drinking 2 – 4 ounce servings during every rest period. A recommended alternative to water is an electrolyte drink split 50/50 with water.

5. *Heat exhaustion* results from salt and water loss along with peripheral pooling of blood. Like heat cramps, heat exhaustion tends to occur in persons in good physical health who are working in high temperatures and humidity. Heat exhaustion may come on suddenly as dizziness and collapse. Untreated, heat exhaustion may progress to heat stroke.
6. *Treatment for heat exhaustion:* Move the victim to a cool environment (e.g. air-conditioned room/car), lay victim down and fan him/her. If the air-conditioning is not available, remove the victim to a shaded area, remove shirt, and fan. If symptoms do not subside within an hour, notify 911 to transport to hospital.
7. *Heat stroke* results from the body's inability to dissipate excess heat. A true medical emergency that requires immediate care, it usually occurs when one ignores the signs of heat exhaustion and continues strenuous activities. Working when the relative humidity exceeds 60% is a particular problem. Workers in the early phase of heat stress may not be coherent of they will be confused, delirious or comatose. Changes in behavior, irritability and combativeness are useful early signs of heat stroke.
8. *Treatment of heat stroke:* Move the victim to a cool, air-conditioned environment. Place victim in a semi-reclined position with head elevated and strip to underclothing. Cool victim as rapidly as possible, applying ice packs to the arms and legs and massaging the neck and torso. Spray victim with tepid water and constantly fan to promote evaporation. Notify 911 to transport to hospital as soon as possible.

TABLE 1

SYMPTOMS OF HEAT STRESS

Heat cramps are caused by heavy sweating with inadequate fluid intake. Symptoms include;

- Muscle cramps
- Cramps in the hands, legs, feet and abdomen

Heat exhaustion occurs when body organs attempt to keep the body cool. Symptoms include;

- | | |
|----------------------------------|--------------------|
| • Pale, cool moist skin | • Rapid heart rate |
| • Core temperature elevated 1-2° | • Heavy sweating |
| • Thirst | • Dizziness |
| • Anxiety | • Nausea |

Heat stroke is the most serious form of heat stress. Immediate action must be taken to cool the body before serious injury and death occur. Symptoms are;

- Red, hot, dry skin
- Lack of perspiration
- Seizures
- Dizziness and confusion
- Strong, rapid pulse
- Core temperature of 104° or above
- Coma

TABLE 2**HEAT STRESS INDICATORS**

Heat stress indicator	When to measure	If Exceeds...	Action
Heart rate (pulse)	Beginning of rest period	110 beats per minute	Shorten next work period by 33%
Oral temperature	Beginning of rest period	99°F (after thermometer is under tongue for 3 minutes)	Shorten next work period by 33%
		100.6°F	Prohibit work in impermeable clothing
Body weight	1. Before workday begins (a.m.) 2. After workday ends (p.m.)		Increase fluid intake

COLD STRESS

Cold stress (Hypothermia)

In hypothermia the core body temperature drops below 95°F. Hypothermia can be attributed to a decrease in heat production, increased heat loss or both.

Prevention

Institute the following steps to prevent overexposure of workers to cold:

1. Maintain body core temperature at 98.6°F or above by encouraging workers to drink warm liquids during breaks (preferably not coffee) and wear several layers of clothing that can keep the body warm even when the clothing is wet.
2. Avoid frostbite by adequately covering hands, feet and other extremities. Clothing such as insulated gloves or mittens, earmuffs and hat liners should be worn. To prevent contact frostbite (from touching metal and cold surfaces below 20°F), workers should wear gloves. Tool handles should be covered with insulating material.
3. Adjust work schedules to provide adequate rest periods. When feasible, rotate personnel and perform work during the warmer hours of the day.
4. Provide heated shelter. Workers should remove their outer layer(s) of clothing while in the shelter to allow sweat to evaporate.
5. In the event that wind barriers are constructed around an intrusive operation (such as drilling), the enclosure must be properly vented to prevent the buildup of toxic or explosive gases or vapors. Care must be taken to keep a heat source away from flammable substances.
6. Using a wind chill chart such as the one in Table 3, obtain the equivalent chill temperature (ECT) based on actual wind speed and temperature. Refer to the ECT when setting up work warm-up schedules, planning appropriate clothing, etc. Workers should use warming shelters at regular intervals at or below an ECT of 20°F. For exposed skin, continuous exposure should not be permitted at or below an ECT of -25°F.

Frostbite

Personnel should be aware of symptoms of frostbite/hypothermia. If the following symptoms are noticed in any worker, he/she should immediately go to a warm shelter.

Condition	Skin Surface	Tissue Under Skin	Skin Color
Frostnip	Soft	Soft	Initially red, then white
Frostbite	Hard	Soft	White and waxy
Freezing	Hard	Hard	Blotchy, white to yellow-gray to gray

1. *Frostnip* is the incipient stage of frostbite, brought about by direct contact with a cold object or exposure of a body part to cool/cold air. Wind chill or cold water also can be major factors. This condition is not serious. Tissue damage is minor and the response to care is good. The tip of the nose, tips of ears, upper cheeks and fingers (all areas generally exposed) are most susceptible to frostnip.
2. *Treatment of frostnip*: Care for frostnip by warming affected areas. Usually the worker can apply warmth from his/her bare hands, blow warm air on the site, or, if the fingers are involved, hold them in the armpits. During recovery, the worker may complain of tingling or burning sensation, which is normal. If the condition does not respond to this simple care, begin treatment for frostbite.
3. *Frostbite*: The skin and subcutaneous layers become involved. If frostnip goes untreated, it becomes superficial frostbite. This condition is serious. Tissue damage may be serious. The worker must be transported to a medical facility for evaluation. The tip of the nose, tips of ears, upper cheeks and fingers (all areas generally exposed) are most susceptible to frostbite. The affected area will feel frozen, but only on the surface. The tissue below the surface must still be soft and have normal response to touch. **DO NOT** squeeze or poke the tissue. The condition of the deeper tissues can be determined by gently palpating the affected area. The skin will turn mottled or blotchy. It may also be white and then turn grayish-yellow.
4. *Treatment of frostbite*: When practical, transport victim as soon as possible. Get the worker inside and keep him/her warm. Do not allow any smoking or alcohol consumption. Thaw frozen parts by immersion, re-warming in a 100°F to 106°F water bath. Water temperature will drop rapidly, requiring additional warm water throughout the process. Cover the thawed part with a dry sterile dressing. Do not puncture or drain any blisters.

NOTE: Never listen to myths and folk tales about the care of frostbite. *Never* rub a frostbitten or frozen area. *Never* rub snow on a frostbitten or frozen area. Rubbing the area may cause

serious damage to already injured tissues. Do not attempt to thaw a frozen area if there is any chance it will be re-frozen.

5. *General cooling/Hypothermia:* General cooling of the body is known as systemic hypothermia. This condition is not a common problem unless workers are exposed to cold for prolonged periods of time without any shelter.

Body Temperature	°C	Symptoms
99-96	37-35.5	Intense, uncontrollable shivering
95-91	35.5-32.7	Violent shivering persists. If victim is conscious, he has difficulty speaking.
90-86	32-30	Shivering decreases and is replaced by strong muscular rigidity. Muscle coordination is affected. Erratic or jerkey movements are produced. Thinking is less clear. General comprehension is dulled. There may be total amnesia. The worker is generally still able to maintain the appearance of psychological contact with his surroundings.
85-81	29.4-27.2	Victim becomes irrational, loses contact with his environment, and drifts into a stuporous state. Muscular rigidity continues. Pulse and respirations are slow and the worker may develop cardiac arrhythmias.
80-78	26.6-18.5	Victim becomes unconscious. He does not respond to the spoken word. Most reflexes cease to function. Heartbeat becomes erratic
Below 78	25.5	Cardiac and respiratory centers of the brain fail. Ventricular fibrillation occurs; probably edema and hemorrhage in the lungs; death.

6. *Treatment of hypothermia:* Keep worker dry. Remove any wet clothing and replace with dry clothes, or wrap person in dry blankets. Keep person at rest. Do not allow him/her to move around. Transport the victim to a medical facility as soon as possible.

TABLE 3⁽¹⁾
COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED
AS AN EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)

Estimated wind Speed (in mph)	Actual Temperature Reading (°F)P												
	50	40	30	20	10	0	10	20	30	40	50	60	
	Equivalent Chill Temperature (°F)												
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60	
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68	
10	40	28	15	4	-9	-24	-33	-46	-58	-70	-83	-95	
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112	
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121	
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133	
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140	
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145	
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-146	
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER in < hr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute			GREAT DANGER may freeze within 30 seconds.					Flesh
	Trench foot and imersion foot may occur at any point on this chart												

Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

(1) Reproduced from American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1985-1986, p.01.

Appendix D

Medical Data Sheet

MEDICAL DATA SHEET

The brief medical data sheet shall be completed by on-site personnel and will be kept in the Support Zone by the HSO as a project record during the conduct of site operations. It accompanies any personnel when medical assistance is needed or if transport to a hospital is required.

Project: _____

Name: _____

Home Telephone: _____

Address: _____

Age: _____ Height: _____ Weight: _____ Blood Type: _____

Name and Telephone Number of Emergency Contact: _____

Drug or Other Allergies: _____

Particular Sensitivities: _____

Do You Wear Contacts? _____

Provide A Check List Of Previous Illnesses: _____

What Medications Are You Presently Using? _____

Do You Have Any Medical Restrictions? _____

Name, Address, And Phone Number Of Personal Physician: _____

Appendix E

General Health and Safety Work Practices

GENERAL HEALTH AND SAFETY WORK PRACTICES

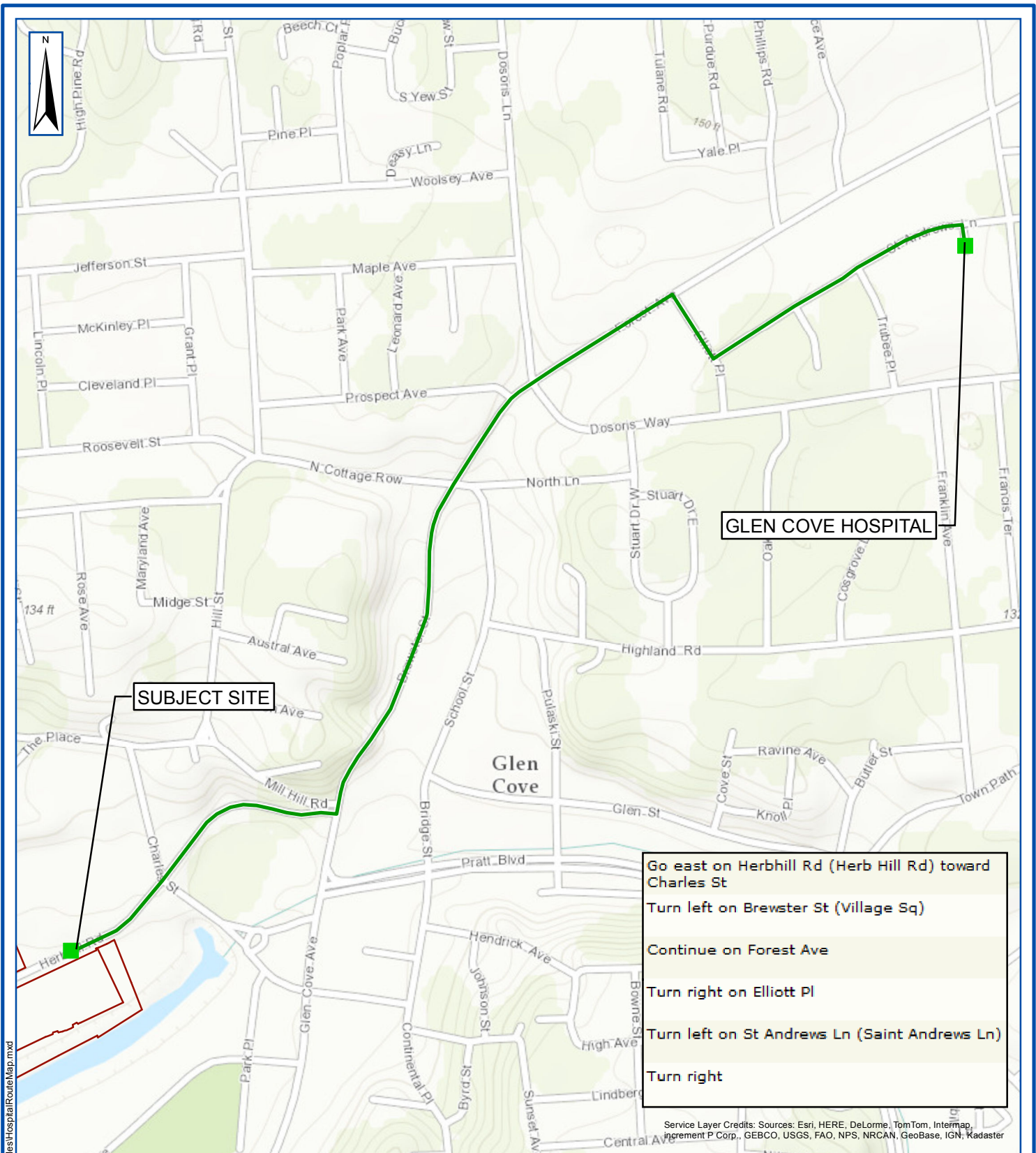
1. Site personnel must attend each day's Daily Briefing and sign the attendance sheet.
2. Any individual taking prescribed drugs shall inform the FTL/HSO of the type of medication. The FTL/HSO will review the matter with the HSM and the Corporate Medical Consultant (CMC), who will decide if the employee can safely work on-site while taking the medication.
3. The personal protective equipment specified by the FTL/HSO and/or associated procedures shall be worn by site personnel. This includes hard hats and safety glasses which must be worn in active work areas.
4. Facial hair (beards, long sideburns or mustaches) which may interfere with a satisfactory fit of a respirator mask is not allowed on any person who may be required to wear a respirator.
5. Personnel must follow proper decontamination procedures and shower as soon as possible upon completion of work shift.
6. Eating, drinking, chewing tobacco or gum, smoking and any other practice that may increase the possibility of hand-to-mouth contact is prohibited in the exclusion zone or the contamination reduction zone. (Exceptions may be permitted by the HSM to allow fluid intake during heat stress conditions).
7. Lighters, matches, cigarettes and other forms of tobacco are prohibited in the Exclusion Zone.
8. Signs and demarcations shall be followed. Such signs and demarcation shall not be removed, except as authorized by the FTL/HSO.
9. No one shall enter a permit-required confined space without a permit and appropriate training. Confined space entry permits shall be implemented as issued.
10. Personnel must follow Hot Work Permits as issued.
11. Personnel must use the Buddy System in the Exclusion Zone.
12. Personnel must follow the work-rest regimens and other practices required by the heat stress program.
13. Personnel must follow lockout/tagout procedures when working on equipment involving moving parts or hazardous energy sources.
14. No person shall operate equipment unless trained and authorized.
15. No one may enter an excavation greater than four feet deep unless authorized by the Competent Person. Excavations must be sloped or shored properly. Safe means of access and egress from excavations must be maintained.
16. Ladders and scaffolds shall be solidly constructed, in good working condition, and inspected prior to use. No one may use defective ladders or scaffolds.

17. Fall protection or fall arrest systems must be in place when working at elevations greater than six feet for temporary working surfaces and four feet for fixed platforms.
18. Safety belts, harnesses and lanyards must be selected by the Supervisor. The user must inspect the equipment prior to use. No defective personal fall protection equipment shall be used. Personal fall protection that has been shock loaded must be discarded.
19. Hand and portable power tools must be inspected prior to use. Defective tools and equipment shall not be used.
20. Ground fault interrupters shall be used for cord and plug equipment used outdoors or in damp locations. Electrical cords shall be kept out walkways and puddles unless protected and rated for the service.
21. Improper use, mishandling, or tampering with health and safety equipment and samples is prohibited.
22. Horseplay of any kind is prohibited.
23. Possession or use of alcoholic beverages, controlled substances, or firearms on any site is forbidden.
24. Incidents, no matter how minor, must be reported immediately to the Supervisor.
25. Personnel shall be familiar with the Site Emergency Action Plan, which is contained in Section 12 of the HASP/EAP.

The above Health and Safety Rules are not all inclusive and it is your responsibility to comply with regulations set forth by OSHA, the client, PWGC Supervisors, and the FTL/HSO.

Appendix F

Hospital Route Map and Directions

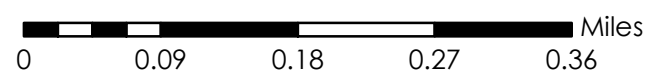


Document Path: G:\Projects\M-R\RG1150\Mapfiles\HospitalRouteMap.mxd



PWGC
 Strategic Environmental and Engineering Solutions
 P.W. GROSSER CONSULTING, INC.
 630 Johnson Avenue, Suite 7
 Bohemia, NY 11716-2618
 Phone: (631) 589-6353 • Fax: (631) 589-8705
 E-mail: INFO@PWGROSSER.COM

HOSPITAL ROUTE MAP



Project:	
Date:	6/22/2015
Designed by:	DE
Drawn by:	JCG
Approved by:	DE
Figure No:	1

Appendix G

Incident Report Form / Investigation Form

INCIDENT / NEAR MISS REPORT AND INVESTIGATION - PAGE 1 OF 2		
TYPE OF INCIDENT - CHECK ALL THAT APPLY		
<input type="checkbox"/> INJURY/ILLNESS	<input type="checkbox"/> VEHICLE DAMAGE	<input type="checkbox"/> PROPERTY DAMAGE
<input type="checkbox"/> FIRE	<input type="checkbox"/> SPILL/RELEASE	<input type="checkbox"/> PERMIT EXCEEDENCE
<input type="checkbox"/> NEAR MISS	<input type="checkbox"/> OTHER	
GENERAL INFORMATION		
PROJECT NAME:	DATE OF REPORT:	REPORT NO.:
DATE OF INCIDENT:	TIME:	DAY OF WEEK:
LOCATION OF INCIDENT:		
WEATHER CONDITIONS: ADEQUATE LIGHTING AT SCENE? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A		
DESCRIBE WHAT HAPPENED (STEP BY STEP - USE ADDITIONAL PAGES IF NECESSARY)		
AFFECTED EMPLOYEE INFORMATION		
NAME:	EMPLOYEE: <input type="checkbox"/> YES <input type="checkbox"/> NO	
HOME ADDRESS:		
SOCIAL SECURITY NO.:	HOME PHONE NO.:	
JOB CLASSIFICATION:	YEARS IN JOB CLASSIFICATION:	
HOURS WORKED ON SHIFT PRIOR TO INCIDENT:	AGE:	
DID INCIDENT RELATE TO ROUTINE TASK FOR JOB CLASSIFICATION? <input type="checkbox"/> YES <input type="checkbox"/> NO		
INJURY/ILLNESS INFORMATION		
NATURE OF INJURY OR ILLNESS:		
OBJECT/EQUIPMENT/SUBSTANCE CAUSING HARM:		
FIRST AID PROVIDED? <input type="checkbox"/> YES <input type="checkbox"/> NO		
IF YES, WHERE WAS IT GIVEN: <input type="checkbox"/> ON-SITE <input type="checkbox"/> OFF-SITE		
IF YES, WHO PROVIDED FIRST AID:		
WILL THE INJURY/ILLNESS RESULT IN: <input type="checkbox"/> RESTRICTED DUTY <input type="checkbox"/> LOST TIME <input type="checkbox"/> UNKNOWN		

INCIDENT / NEAR MISS REPORT AND INVESTIGATION - PAGE 2 OF 2		REPORT NO.
MEDICAL TREATMENT INFORMATION		
WAS MEDICAL TREATMENT PROVIDED? <input type="checkbox"/> YES <input type="checkbox"/> NO		
IF YES, WAS MEDICAL TREATMENT PROVIDED: <input type="checkbox"/> ON-SITE <input type="checkbox"/> DR.'S OFFICE <input type="checkbox"/> HOSPITAL		
NAME OF PERSON(S) PROVIDING TREATMENT:		
ADDRESS WHERE TREATMENT WAS PROVIDED:		
TYPE OF TREATMENT:		
VEHICLE AND PROPERTY DAMAGE INFORMATION		
VEHICLE/PROPERTY DAMAGED:		
DESCRIPTION OF DAMAGE:		
SPILL AND AIR EMISSIONS INFORMATION:		
SUBSTANCE SPILLED OR RELEASED:	FROM WHERE:	TO WHERE:
ESTIMATED QUANTITY/DURATION:		
CERCLA HAZARDOUS SUBSTANCE? <input type="checkbox"/> YES <input type="checkbox"/> NO		
REPORTABLE TO AGENCY? <input type="checkbox"/> YES <input type="checkbox"/> NO SPECIFY:		
WRITTEN REPORT: <input type="checkbox"/> YES <input type="checkbox"/> NO TIME FRAME:		
RESPONSE ACTION TAKEN:		
PERMIT EXCEEDENCE		
TYPE OF PERMIT:	PERMIT #:	
DATE OF EXCEEDENCE:	DATE FIRST KNOWLEDGE OF EXCEEDENCE:	
PERMITTED LEVEL OR CRITERIA:		
EXCEEDENCE LEVEL OR CRITERIA:		
REPORTABLE TO AGENCY? <input type="checkbox"/> YES <input type="checkbox"/> NO SPECIFY:		
WRITTEN REPORT: <input type="checkbox"/> YES <input type="checkbox"/> NO TIME FRAME:		
RESPONSE ACTION TAKEN:		
NOTIFICATIONS		
NAMES OF PERSONNEL NOTIFIED:	DATE/TIME:	
CLIENT NOTIFIED:	DATE/TIME:	
AGENCY NOTIFIED:	DATE/TIME:	
CONTACT NAME:		
PERSONS PREPARING REPORT		
EMPLOYEE'S NAME:(PRINT)	SIGN:	
SUPERVISOR'S NAME:(PRINT)	SIGN:	

INVESTIGATIVE REPORT			
DATE OF INCIDENT:		DATE OF REPORT:	
REPORT NUMBER:			
INCIDENT COST: ESTIMATED: \$ _____		ACTUAL: \$ _____	
OSHA RECORDABLE(S): <input type="checkbox"/> YES <input type="checkbox"/> NO # RESTRICTED DAYS ____ # DAYS AWAY FROM WORK ____			
CAUSE ANALYSIS			
IMMEDIATE CAUSES - WHAT ACTIONS AND CONDITIONS CONTRIBUTED TO THIS EVENT?			
BASIC CAUSES - WHAT SPECIFIC PERSONAL OR JOB FACTORS CONTRIBUTED TO THIS EVENT?			
ACTION PLAN			
REMEDIAL ACTIONS - WHAT HAS AND OR SHOULD BE DONE TO CONTROL EACH OF THE CAUSES LISTED?			
ACTION	PERSON RESPONSIBLE	TARGET DATE	COMPLETION DATE
PERSONS PERFORMING INVESTIGATION			
INVESTIGATOR'S NAME: (PRINT)		SIGN:	DATE:
INVESTIGATOR'S NAME: (PRINT)		SIGN:	DATE:
INVESTIGATOR'S NAME: (PRINT)		SIGN:	DATE:
MANAGEMENT REVIEW			
PROJECT MANAGER: (PRINT)		SIGN:	DATE:
COMMENTS:			
H&S MANAGER: (PRINT)		SIGN:	DATE:
COMMENTS:			

EXAMPLES OF IMMEDIATE CAUSES

Substandard Actions

1. Operating equipment without authority
2. Failure to warn
3. Failure to secure
4. Operating at improper speed
5. Making safety devices inoperable
6. Removing safety devices
7. Using defective equipment
8. Failure to use PPE properly
9. Improper loading
10. Improper placement
11. Improper lifting
12. Improper position for task
13. Servicing equipment in operation
14. Under influence of alcohol/drugs
15. Horseplay

Substandard Conditions

1. Guards or barriers
2. Protective equipment
3. Tools, equipment, or materials
4. Congestion
5. Warning system
6. Fire and explosion hazards
7. Poor housekeeping
8. Noise exposure
9. Exposure to hazardous materials
10. Extreme temperature exposure
11. Illumination
12. Ventilation
13. Visibility

EXAMPLES OF BASIC CAUSES

Personal Factors

1. Capability
2. Knowledge
3. Skill
4. Stress
5. Motivation
6. Work Standards
7. Wear and tear
8. Abuse or misuse

Job Factors

1. Supervision
2. Engineering
3. Purchasing
4. Maintenance
5. Tools/equipment

MANAGEMENT PROGRAMS FOR CONTROL OF INCIDENTS

- | | |
|----------------------------------|-----------------------------|
| 1. Leadership and administration | 10. Health control |
| 2. Management training | 11. Program audits |
| 3. Planned inspections | 12. Engineering controls |
| 4. Task analysis and procedures | 13. Personal communications |
| 5. Task observation | 14. Group meetings |
| 6. Emergency preparedness | 15. General promotion |
| 7. Organizational rules | 16. Hiring and placement |
| 8. Accident/incident analysis | 17. Purchasing controls |
| 9. Personal protective equipment | |

Appendix H

Daily Briefing Sign-In Sheet

DAILY BRIEFING SIGN-IN SHEET

Date: _____

Project Name/Location: _____

Person Conducting Briefing: _____

1. AWARENESS (topics discussed, special safety concerns, recent incidents, etc.)

2. OTHER ISSUES (HASP/EAP changes, attendee comments, etc.)

3. ATTENDEES (Print Name):

1.	21.
2.	22.
3.	23.
4.	24.
5.	25.
6.	26.
7.	27.
8.	28.
9.	29.
10.	30.
11.	31.
12.	32.
13.	33.
14.	34.
15.	35.
16.	36.
17.	37.
18.	38.
19.	39.
20.	40.

APENDIX B
QUALITY ASSURANCE PROJECT PLAN

SITE-SPECIFIC UNIFORM FEDERAL POLICY (UFP)
QUALITY ASSURANCE PROJECT PLAN (QAPP)

FORMER CAPTAINS COVE SITE
Glen Cove, New York

Prepared By:
P.W. Grosser Consulting, Inc. (PWGC)
630 Johnson Avenue, Suite 7
Bohemia, New York 11716

MARCH 2016

TABLE OF CONTENTS (TOC)

CROSSWALK	5
QAPP Worksheet #1 & 2: Title and Approval Page.....	8
QAPP Worksheet #3 & 5: Project Organization and QAPP Distribution	10
QAPP Worksheet #4, 7 & 8: Personnel Qualifications	11
QAPP Worksheet #6: Communication Pathways.....	14
QAPP Worksheet #9: Project Planning Session Summary	16
QAPP Worksheet #10: Conceptual Site Model	18
QAPP Worksheet #11: Project/Data Quality Objectives.....	22
QAPP Worksheet #12A: Measurement Performance Criteria.....	24
QAPP Worksheet #12B: Measurement Performance Criteria.....	26
QAPP Worksheet #12C: Measurement Performance Criteria.....	28
QAPP Worksheet #12D: Measurement Performance Criteria.....	31
QAPP Worksheet #12E: Measurement Performance Criteria	33
QAPP Worksheet #13: Secondary Data Uses and Limitations.....	35
QAPP Worksheet #14/16: Project Tasks & Schedule.....	37
QAPP Worksheet #15: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits.....	38
QAPP Worksheet #17: Sampling Design and Rationale.....	42
QAPP Worksheet #18: Sampling Locations and Methods	44
QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times	45
QAPP Worksheet #20: Field QC Summary	46
QAPP Worksheet #21: Field SOPs	47
QAPP Worksheet #22: Field Equipment Calibration, Maintenance, Testing, and Inspection	48
QAPP Worksheet #23: Analytical SOP's	49
QAPP Worksheet #24: Analytical Instrument Calibration	52
QAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection.....	54
QAPP Worksheet #26 & 27: Sample Handling, Custody, and Disposal	57
QAPP Worksheet #28a: Analytical Quality Control and Corrective Action	60
QAPP Worksheet #28b: Analytical Quality Control and Corrective Action	62
QAPP Worksheet #28c: Analytical Quality Control and Corrective Action.....	63
QAPP Worksheet #28d: Analytical Quality Control and Corrective Action	65

QAPP Worksheet #28e: Analytical Quality Control and Corrective Action	66
QAPP Worksheet #29: Project Documents and Records	67
QAPP Worksheet #31, 32 & 33: Assessments and Corrective Action.....	68
QAPP Worksheet #34: Data Verification and Validation Inputs	70
QAPP Worksheet #35: Data Verification Procedures	71
QAPP Worksheet #36.....	73
QAPP Worksheet #37: Data Usability Assessment	76

ATTACHMENTS

ATTACHMENTS

A Standard Operating Procedures (SOPs)

ACRONYM	DEFINITION
%R	Percent Recovery
AES	Atomic Emission Spectrometry
ASP	Analytical Services Protocol
COC	Chain-of-Custody
D&B	D&B Engineers & Architects, P.C.
DQI	Data Quality Indicator
EDD	Electronic Data Deliverables
ELAP	Environmental Laboratory Approval Program
ERT	Environmental Response Team
ESD	Explanation of Significant Differences
FTL	Field Team Leader
ICP	Inductively Coupled Plasma
LDC	Laboratory Data Consultants, Inc.
LOQ	Limit of Quantitation
MDL	Method Detection Limit
MS	Mass Spectrometry
NFG	National Functional Guidance
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety & Health Administration
PM	Program Manager
POC	Point of Contact
PQO	Project Quality Objective
PWGC	P.W. Grosser Consulting, Inc.
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RACR	Remedial Action Completion Report
RAWP	Remedial Action Work Plan
RL	Reporting Limit
ROD	Record of Decision
RPD	Relative Percent Difference
SOP	Standard Operating Procedure
SSRC	Site Specific Removal Criteria
SVOC	Semi-Volatile Organic Compound
TAL	Test America Laboratories, Inc.
TBD	To Be Determined
TOC	Table of Contents
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

CROSSWALK

The following table provides a “cross-walk” between the QAPP elements outlined in the UFP for QAPP (UFP-QAPP Manual), the necessary information, and the location of the information within the text document and corresponding QAPP Worksheet. Any QAPP elements and required information that are not applicable to the project are circled.

QAPP Element(s) and Corresponding Section(s) of UFP-QAPP Manual	Required Information	Crosswalk to QAPP Section	Crosswalk to QAPP Worksheet No.
Project Management and Objectives			
2.1 Title and Approval Page	-Title and Approval Page	Approval Page	1
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control 2.2.3 TOC 2.2.4 QAPP Identifying Information	-TOC -QAPP Identifying Information	TOC Approval Page	2
2.3 Distribution List and Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	-Distribution List -Project Personnel Sign-Off Sheet	Approval Page	3 4
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certifications	-Project Organizational Chart -Communication Pathways -Personnel Responsibilities and Qualifications -Special Personnel Training Requirements	2	5 6 7 8
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, & Background	-Project Planning Session Documentation -Project Scoping Session -Problem Definition, Site History, & Background -Site Maps	1	9 10
2.6 Project Quality Objectives and Measurement Performance Criteria 2.6.1 Development of Project Quality Objectives (PQOs) Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	-Site Specific PQOs -Measurement Performance Criteria	3	11 12
2.7 Secondary Data Evaluation	-Sources of Secondary Data and Information -Secondary Data Criteria and Limitations	1 2	13
2.8 Project Overview and Schedule 2.8.1 Project Overview	-Summary of Project Tasks	4	14

2.8.2 Project Schedule	-Reference Limits and Evaluation -Project Schedule/Timeline		15 16
Measurement/Data Acquisition			
3.1 Sample Tasks	-Sampling Design and Rationale	5	17
3.1.1 Sampling Process Design and Rationale			
3.1.2 Sampling Procedures and Requirements	-Sample Location Map		
3.1.2.1 Sampling Collection Procedures	-Sampling Locations and Methods/SOP Requirements		18
3.1.2.2 Sample Containers, Volume, and Preservation			
3.1.2.3 Equipment/Sample Containers Cleaning & Decontamination Procedures	-Analytical Methods/SOP Requirements		19
3.1.2.4 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures	-Field Quality Control Sample Summary		20
3.1.2.5 Supply Inspection and Acceptance Procedures	-Sampling SOPs -Project Sampling SOP		21
3.1.2.6 Field Documentation Procedures	References -Field Equipment Calibration, Maintenance, Testing, and Inspection		22
3.2 Analytical Tasks	-Analytical SOPs	6	23
3.2.1 Analytical SOPs	-Analytical SOP		
3.2.2 Analytical Instrument Calibration	References		
3.2.3 Analytical Instrument and Equipment Maintenance, Testing & Inspection Procedures	-Analytical Instrument Calibration		24
3.2.4 Analytical Supply Inspection & Acceptance Procedures	-Analytical Instrument & Equipment Maintenance, Testing & Inspection		25
3.3 Sample Collection Documentation, Handling, Tracking, & Custody Procedures	-Sample Collection Documentation	7	27
3.3.1 Sample Collection Documentation	Handling, Tracking, & Custody SOPs		
3.3.2 Sample Handling and Tracking System	-Sample Container Identification		
3.3.3 Sample Custody	-Sample Handling Flow Diagram -Example Chain-of-Custody (COC) Form and Seal		26
3.4 Quality Control (QC) Samples	-QC Samples	5	28
3.4.1 Sampling QC Samples	-Screening/Confirmatory		
3.4.2 Analytical QC Samples	Analysis Decision Tree		

3.5 Data Management Tasks	-Project Documents & Records	6	29
3.5.1 Project Documentation and Records			
3.5.2 Data Package Deliverables	-Analytical Services		30
3.5.3 Data Reporting Formats	-Data Management SOPs		
3.5.4 Data Handling & Management			
3.5.5 Data Tracking and Control			
Assessment/Oversight			
4.1 Assessments & Response Actions	-Assessments & Response Actions	8	31
4.1.1 Planned Assessments			
4.1.2 Assessment Findings & Corrective Action Responses	-Planned Project Assessments -Audit Checklists -Assessment Findings & Corrective Action Responses		32
4.2 Quality Assurance (QA) Management Reports	-QA Management Reports		33
4.3 Final Project Report	-Final Report(s)		
Data Review			
5.1 Overview			
5.2 Data Review Steps	-Verifications (Step I) Process	9	34
5.2.1 Step I: Verification			
5.2.2 Step II: Validation	-Validation (Step IIa and IIb) Process		35
5.2.2.1 Step IIa Validation Activities			
5.2.2.2 Step IIb Validation Activities	-Validation (Step IIa and IIb) Summary		36
5.2.3 Step III: Usability Assessment			
5.2.3.1 Data Limitations and Actions from Usability Assessment	-Usability Assessment		37
5.2.3.2 Activities			

QAPP Worksheet #1 & 2: Title and Approval Page
(UFP-QAPP Manual Section 2.1)
(United States Environmental Protection Agency (USEPA) 2106-G-05 Section 2.2.1)

1. Project Identifying Information

- a. Site name/project name: Former Captains Cove Site
- b. Site location/number: Garvies Point Road, Glen Cove, New York 11542 / 1-30-032

2. Lead Organization – PWGC

a. Project Manager (PM)

Derek Ersbak/PM/PWGC

Printed Name/Title/Organization

 3/21/16

Signature/Date

b. State Regulatory Agency

Heidi-Marie Dudek, PE/PM/NYSDEC¹

Printed Name/Title/Organization

Signature/Date

c. Federal Regulatory Agency

Lorenzo Thantu/Remedial PM/USEPA

Printed Name/Title/Organization

Signature/Date

3. List plans and reports from previous investigations relevant to this project

- a. Roux Associates, Inc., Final Remedial Investigation Report, January 1999;
- b. Metron Development Services, Glen Isle Field Verification Program Certification Sampling Event #1, May 2004;
- c. PWGC, Pre-Construction Confirmatory/Insurance Data Gap Subsurface Investigation Report, May 2014;
- d. Gannett Fleming Engineers, P.C., Draft Contaminated Material Assessment Report, January 2015;
- e. PWGC, Leachable Arsenic and Lead Sampling Report, February 2015;
- f. PWGC, Pre-Construction Confirmatory/Insurance Data Gap Subsurface Investigation Report Addendum 1, February 2016; and,

¹ NYSDEC – New York State Department of Environmental Conservation

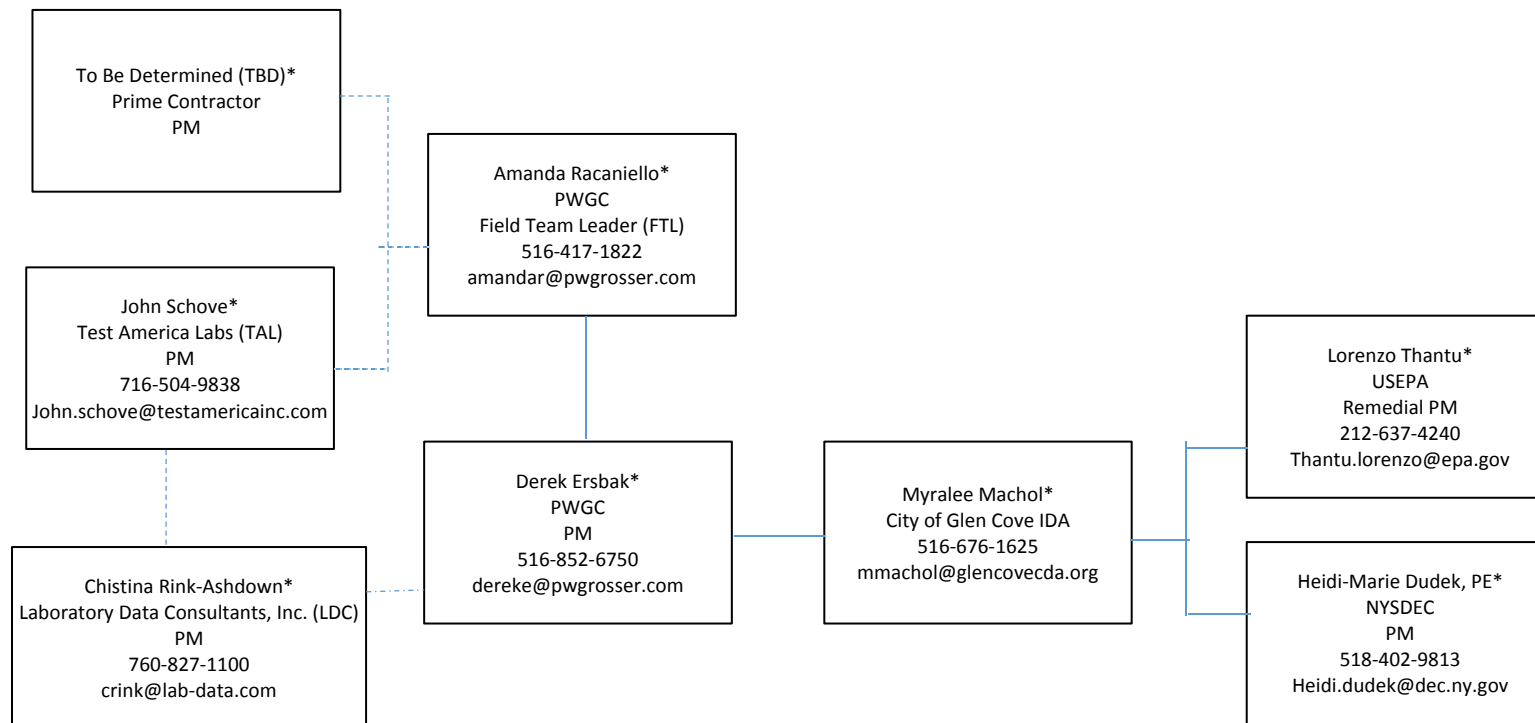
- g. PWGC, Synthetic Precipitation Leaching Procedure Investigation/Red Flag Area Characterization Report, February 2016.

QAPP Worksheet #3 & 5: Project Organization and QAPP Distribution
(UFP-QAPP Manual Section 2.3 and 2.4)
(USEPA 2106-G-05 Section 2.2.3 and 2.2.4)

*QAPP recipient

Lines of authority _____

Lines of Communication - - - - -



QAPP Worksheet #4, 7 & 8: Personnel Qualifications
(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)
(USEPA 2106-G-05 Section 2.2.1 and 2.2.7)

ORGANIZATION: Prime Consultant - PWGC

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications
Derek Ersbak	PM / Maintains direct contact with POC for site activities.	B.S. Biology (Ecology, Evolution & Behavior) SUNY Binghamton, over 9 years' experience with field and laboratory QA/QC procedures and preparing QAPPs.	40-Hour Occupational Safety & Health Administration (OSHA) Hazardous Waste Site Worker Training; 8-Hour OSHA Refresher Training; 8 Hour OSHA Supervisor Training, and 10-Hour Construction Safety & Health Training.
Amanda Racaniello	FTL/Maintains direct contact with PM, manages daily field activities, ensures implementation of QAPP.	B.A. Environmental Studies SUNY Stony Brook, over 3-years' experience with field sampling / QA/QC protocol.	40-Hour OSHA Hazardous Waste Site Worker Training; 8-Hour OSHA Refresher Training; 8 Hour OSHA Supervisor Training, and 10-Hour Construction Safety & Health Training.

ORGANIZATION: Prime Contractor (TBD)

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications
TBD	TBD	TBD	40-Hour OSHA Hazardous Waste Site Worker Training and 8-Hour OSHA Refresher Training;

ORGANIZATION: Laboratory - TAL

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications
John Schove	PM/Manages sample transportation, orders, and QA/QC	B.S. Chemistry SUNY Fredonia/Over 17 years' of experience with environmental laboratory work	

ORGANIZATION: Data Validation Consultant - LDC

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications
Christina Rink-Ashdown	PM/Manages the validation of data.	B.S. Biology UC San Diego/Over 8 years' experience with environmental laboratory and data validation.	

QAPP Worksheet #6: Communication Pathways
(UFP-QAPP Manual Section 2.4.2)
(USEPA 2106-G-05 Section 2.2.4)

Communication Driver	Organization	Name	Contact Information	Procedure (timing, pathway, documentation, etc.)
Regulatory agency interface	USEPA	Lorenzo Thantu	212-637-4240 Thantu.lorenzo@epa.gov	Maintains lines of communication between USEPA, NYSDEC and D&B, approves site-specific QAPPs in accordance with USEPA guidance documents and policy, and provides guidance or instruction for site-specific QA documents.
	NYSDEC	Heidi-Marie Dudek	518-402-9813 Heidi.dudek@dec.ny.gov	
Field progress reports	PWGC FTL	Amanda Racaniello	516-417-1822 amandar@pwgrosner.com	Prepares daily field report and submits to PWGC PM.
Stop work due to safety issues	PWGC FTL	Amanda Racaniello	516-417-1822 amandar@pwgrosner.com	Communicates with PWGC PM regarding safety issues/reporting on a daily basis, when required.
QAPP changes prior to field work	PWGC PM	Derek Ersbak	631-589-6353 dereke@pwgrosner.com	Communicates changes to QAPP to D&B and USEPA/NYSDEC and determines need for field and analytical corrective actions.
QAPP changes during project execution	PWGC FTL	Amanda Racaniello	516-417-1822 amandar@pwgrosner.com	Communicates QAPP to PWGC PM on a daily basis, when required.
Field corrective actions	PWGC FTL	Amanda Racaniello	516-417-1822 amandar@pwgrosner.com	Communicates field activities to PWGC PM on a daily basis, when required.
Sample receipt variances	TAL PM	John Schove	718-504-9838 John.schove@testamericainc.com	The TAL PM will report any issues with project samples to the PWGC PM.

Laboratory quality control variances	TAL QA Manager	Carl Armbruster	732-549-3900 Carl.armbruster@testamericainc.com	The TAL QA manager will report any issues with project samples to the PWGC PM.
Analytical corrective actions	TAL QA Manager	Carl Armbruster	732-549-3900 Carl.armbruster@testamericainc.com	The TAL QA manager will report any issues with project samples to the PWGC PM.
Data verification issues, e.g., incomplete records	TAL QA Manager	Carl Armbruster	732-549-3900 Carl.armbruster@testamericainc.com	The TAL QA manager will report any issues with project samples to the PWGC PM.
Data validation issues, e.g., non-compliance with procedures	TAL QA Manager	Carl Armbruster	732-549-3900 Carl.armbruster@testamericainc.com	The TAL QA manager will report any issues with project samples to the PWGC PM.
Data review corrective actions	LDC PM	Christina Rink-Ashdown	760-827-1100 crink@lab-data.com	The LDC PM will report any issues with the analytical results to the TAL and PWGC PM.

QAPP Worksheet #9: Project Planning Session Summary
(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(USEPA 2106-G-05 Section 2.2.5)

Date of planning session: February 3, 2016

Location: NYSDEC Central Office Room 919

Purpose: This meeting was conducted to define the approach for the Glen Cove Waterfront Revitalization Project

Participants:

Name	Organization	Name	Organization
D. Garbarini	USEPA	C. Bethoney	NYSDOH
S. Badalamenti	USEPA	B. Boyd	NYSDOH
L. Thantu	USEPA	M. Machol	GCIDA/GCCDA
J. Doyle	USEPA	F. DeVita	D&B
M. Ludmer	USEPA	J. VanHorn	D&B
R. Schick	NYSDEC	M. Graham	Phillips Lytle, LLP
M. Cruden	NYSDEC	A. Lacchetta	Phillips Lytle, LLP
J. Harrington	NYSDEC	F. Haftel	RXRGIP
W. Parish	NYSDEC	J. Laserson	RXRGIP
G. Burke	NYSDEC	G. Allen	RXRGIP
H. Dudek	NYSDEC		
R. Rusinco	NYSDEC		
B. Conlon	NYSDEC		

Consensus decisions made: The USEPA intends to amend the decision documents for the Li Tungsten Site and the NYSDEC intends to amend the decision documents for the Captain's Cove Site. The GCIDA in partnership with RXRGIP will submit a separate Remedial Action Scope of Work for each site to implement the amended remedy at each site.

Action Items:

Action	Responsible Party	Due Date
Amend Decision Document6s for the Li Tungsten Site	USEPA	3/7/2016

Action	Responsible Party	Due Date
Amend the Decision Documents for the Captain's Cove Site	NYSDEC	3/7/2016
Submit RASOW for Agency	GCIDA/RXRGIP	3/8/2016

QAPP Worksheet #10: Conceptual Site Model
(UFP-QAPP Manual Section 2.5.2)
(USEPA 2106-G-05 Section 2.2.5)

BACKGROUND INFORMATION

Site Location and Description

The Site is located in Glen Cove, Nassau County, New York. The Site is approximately 16.6-acres in size and is bounded by Garvies Point Road and Garvies Point Preserve to the north, Glen Cove Creek to the south, Glen Cove Angler's Club to the east, and Glen Cove Industrial Development Agency owned property to the west. Please note that the Site, as defined in this QAPP, does not include the eastern extent of the property. This portion of the Site has been remediated and is currently being utilized by the City for Ferry Terminal operations.

Site History

Beginning in the late 1950s and continuing until approximately the late 1970's, a portion of the Site was predominantly used as a "community dump" for the disposal of incinerator ash, sewage sludge, rubbish, household debris, and creek sediments. The Site was also used by local industry, including the Former Li Tungsten operation for the disposal of industrial wastes. Low levels of radioactive ore residuals from the Li Tungsten facility were disposed of on the western and eastern ends of the property. Materials dredged from Glen Cove Creek were also disposed of at the Site. Captain's Cove was purchased by Village Green Realty at Garvies Point, Inc. (Village Green Realty) in 1983 with the intention of developing a residential complex at the Site. Redevelopment efforts were abandoned in 1986 when the NYSDEC designated the property as a Class 2 Inactive Hazardous Waste Site (State Superfund Site) as a result of organic and inorganic contamination in soil and groundwater at the Site. Several condominium structures (condo shells) were partially constructed on-site prior to the State Superfund designation and were never completed. These structures were subsequently demolished by the City.

The following presents a brief summary of the regulatory history for the Site. There are a significant number of documents, including reports, correspondence, etc., related to the Site and remedial activities completed at the Site which have been compiled in a document repository located at the Glen Cove public library. The NYSDEC issued a Record of Decision (ROD) for the Site in March 1999. Additionally, due to the disposal of spent ore residuals from the Former Li Tungsten Site, a portion of the Site is also referenced accordingly in the September 1999 ROD and May 2005 Explanation of Significant Differences (ESD) issued by the USEPA for the Former Li Tungsten Site. The following provides a more detailed description of the RODs and ESD for the Site.

March 1999 NYSDEC ROD

The March 1999 ROD issued by the NYSDEC included the following major remedial components for the Site:

- Excavation of landfill materials and separation of waste streams into various components including: solid waste, hazardous waste, construction and demolition debris and radiological waste. The latter of the three waste streams were disposed off-site, while solid waste materials were allowed to be re-deposited at the Site given specific gradation requirements and that it would be covered with a minimum of 2-feet of clean soil or other suitable material.
- Implementation of a monitoring program (i.e., groundwater quality and soil gas) for a minimum of 5-years to verify the effectiveness of the remedy once completed; and

- Implementation of a deed restriction preventing the Site from being used for residential purposes (i.e., long term single or multi-family housing) and controls to ensure protection of public health during future subsurface activities.

September 1999 USEPA ROD

The September 1999 ROD issued by the USEPA for the Former Li Tungsten Site included a comprehensive remedy to address spent ore deposits found to exist along the western and eastern portion of the Site (otherwise known as Li Tungsten OU-2, Areas A and G). The major components of the remedy included the excavation, volume reduction and off-site disposal of waste ore residuals within these areas of the Site. As there was no evidence of groundwater being contaminated with radionuclides at the Site, no groundwater remedial alternatives were evaluated for Li Tungsten OU-2 as part of this ROD.

May 2005 USEPA ESD

The May 2005 ESD issued by the USEPA for the Former Li Tungsten Site re-evaluated the September 1999 ROD's cleanup criteria in order to address the City's decision to revise the Glen Cove Creek Revitalization Plan to include future residential use of the Site, including Li Tungsten Site OU-2. As part of the ESD, revised radiological soil cleanup objectives were issued for the Site consisting of the following: Radium-226 + Radium-228 (soil) – less than or equal to 5 pCi/g plus background level (1 pCi/g); and Thorium-230 + Thorium-232 (soil) - less than or equal to 5 pCi/g plus background level (1 pCi/g).

March 2016 NYSDEC Proposed Amended ROD and Proposed Remedial Action Plan

The Proposed Amended Record of Decision (ROD) and the Proposed Remedial Action Plan publically noticed by the NYSDEC in March 2016 included requirements for the excavation and off-site disposal of isolated pockets of residual soil contamination as delineated by the Pre-Construction Investigation Report dated March 2016 containing contaminants concentrations above the following site specific removal criteria:

1. Arsenic	175 mg/kg
2. Lead	660 mg/kg
3. Radium-226	> 5 pCi/g*
4. Thorium-232	> 5 pCi/g*
5. Grossly Contaminated Media	As defined in 6 NYCRR Part 375-1.2(u)**
6. Non-Aqueous Phase Liquid (NAPL) 1.2(ac)***	As defined in 6 NYCRR Part 375-

* Not including the natural background radiation of nuclide of approximately 1 pCi/g

** Grossly Contaminated media means soil, sediment, surface water or groundwater which contains sources or substantial quantities of mobile contamination in the form of NAPL, as defined in subdivision 375-1.2 (ac), that is identifiable either visually, through strong odor, by elevated contaminant vapor levels or is otherwise readily detectable without laboratory analysis.

*** NAPL means a contaminant that is a liquid which may be denser or lighter than water and does not mix easily or dissolve in water, but remains as a separate phase.

It is understood that the Proposed Amended ROD and the Proposed Remedial Action Plan publically noticed by the NYSDEC in March 2016, including respective SSRC listed above, are preliminary and subject to public review/comment and final issuance. Therefore, the work conducted under this SOW will be conducted at risk and is subject to revision until final issuance of the decision documents for the Site.

NATURE AND EXTENT OF CONTAMINATION

The following section describes the investigative techniques used to determine the nature and extent of contamination identified at the subject property.

Identification of Source Areas

Sampling conducted at the subject property identified arsenic, lead and grossly contaminated media in several of the subsurface soil samples collected across the subject property.

Extent of Contamination in Soil

The following sample locations contain constituents in exceedance of the site specific Remedial Action Removal Criteria:

- CC-C-004 (Lead)
- CC-C-008 (Lead)
- CC-C-017 (Arsenic)
- CC-C-019 (Arsenic & Lead)
- CC-C-022 (Arsenic)
- CC-C-023 (Lead)
- CC-C-028 (Arsenic & Lead)
- CC-C-029 (Lead)
- CC-C-030 (Lead)
- CC-C-048 (Lead)
- CC-C-051 (Grossly Contaminated Media)
- CC-GI-006 (Lead)
- CC-GI-007 (Lead)
- D2 (Grossly Contaminated Media)

QUALITATIVE EXPOSURE ASSESSMENT

The following sections discuss the qualitative exposure assessments. The qualitative exposure assessments include an evaluation of contaminant sources, potential receptors and contaminant release and transport.

Human Health Exposure Assessment

Appearance and odor vary depending upon the specific organic arsenic. Arsenic may have an adverse effect on human health and can be inhaled, ingested, or absorbed through the skin/eyes. Chronic exposures may have effects on the gastrointestinal tract, reproductive system and liver.

Lead may appear as a bluish-white or silvery-grey solid in various forms. The substance, when heated releases toxic fumes. Lead can have an adverse effect on human health and can be absorbed after inhalation or oral exposure. Chronic exposure may have effects on the blood, bone marrow, central nervous system, resulting in anemia.

Potential Receptor Populations

The subject property is within an area containing a mix of commercial and industrial uses. The area is served by municipal water.

Contaminant Release and Transport

Metals are present in the subsurface soil at the subject property. Spread and migration of subsurface soil is unlikely.

Points of Exposure

There are no plausible off-site pathways for oral, inhalation, or dermal exposure to metals from the contamination identified at the subject property. The only possible on-site exposure pathways are by ingestion or dermal exposure by a trespasser, an employee, or worker at the subject property. Ingestion and dermal exposure would not likely be extensive given the intermittent nature of exposure. Contaminants would most likely be transferred from surfaces containing residual soil (an article of clothing or object such as equipment) that have come into contact with contaminated soil and not through direct ingestion of or contact with the contaminated soil.

QAPP Worksheet #11: Project/Data Quality Objectives
(UFP-QAPP Manual Section 2.6.1)
(USEPA 2106-G-05 Section 2.2.6)

State the Problem

Arsenic, Lead, and grossly contaminated media have been detected in the subsurface soils at the subject property in excess of Remedial Action Removal Criteria. It is believed that the contaminants are a result of historical site operations.

The USEPA/NYSDEC have requested that the contaminants be removed from the subject site to allow for restricted-residential redevelopment.

Identify the Goals of the Remedy

The goal of this remedial program is to remove contaminated materials identified at the Site in excess of the Remedial Action Removal Criteria to facilitate the redevelopment of the Site for restricted-residential purposes.

Identify Information Inputs

To support the above objectives, the following data will be collected:

- Validated soil sample analytical data.
- Geospatial data of sampling locations.
- Field documentation and photographs of site activities.

Define the Boundaries of the Remedy

Spatial Boundaries: The Site is located in Glen Cove, Nassau County, New York. The Site is approximately 16.6-acres in size and is bounded by Garvies Point Road and Garvies Point Preserve to the north, Glen Cove Creek to the south, Glen Cove Angler's Club to the east, and Glen Cove Industrial Development Agency owned property to the west.

Temporal Boundaries: The data collected will represent existing conditions after impact has been removed. A sampling schedule and sampling plan is included in Worksheets 14, 16, and 17.

Practical Constraints on Data Collection: Scheduling adjustments will be made if physical constraints on planned field events occur due to weather, safety considerations, or problems that may impact the technical quality of the measurements or samples.

Develop the Analytic Approach

Samples will be collected from locations designated in the Scope of Work (SOW). Confirmatory soil samples will be analyzed for the suite of constituents identified at each excavation as specified below:

- Metals remediation areas will be analyzed for arsenic and lead by USEPA Method 6010; and,

- Grossly contaminated media areas will be analyzed for Volatile Organic Compounds (VOCs) by USEPA Method 8260 and Semi-volatile Organic Compounds (SVOCs) by USEPA Method 8270, in addition to arsenic and lead by USEPA Method 6010.

Specify Performance or Acceptance Criteria

All data will be reviewed and verified to ensure that they are acceptable for the intended use. All data will be validated in accordance with the procedures specified in Worksheet 36. QC criteria for analytical data are listed in Worksheet 28.

Decision errors will be limited to the extent practicable by following approved USEPA methods and applicable SOPs listed in Worksheet #21. Any deviation from the QAPP will be documented.

Develop the Detailed Plan for Obtaining Data

Soil samples will be collected at the locations detailed in the RAWP. Worksheets 17, 18, 20, and 21 present the sampling design and procedures.

Worksheets 19, 20, 24-28 and 30 specify analytical requirements. Data from the laboratories will be delivered in electronic data deliverable (EDD) and Adobe pdf format. The data will be documented in a Construction Completion Report (CCR).

QAPP Worksheet #12A: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(USEPA 2106-G-05 Section 2.2.6)

Laboratory: TAL
Matrix: Soil
Analytical Group or Method: Volatile Organics, 8260C
Concentration Level: All

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Overall Precision	Field Duplicates	1 per 20 samples per matrix Relative Percent Difference (RPD) \leq 30% when metals are detected in both samples \geq sample-specific Limit of Quantitation (LOQ)
Accuracy	Tuning	Every 12 hours. Injection of BFB evaluated against method tune criteria (Table 3 of EPA 8260C)
Accuracy	Initial Calibration (ICAL)	Initially and when CCV fails Minimum 5-standards; must contain all targets and lowest standard \leq RL. % RSD \leq 20% for all compounds and minimum RF found in Table 4 of method or 'r' \geq 0.99.
Accuracy	Initial Calibration Verification (ICV)	Daily after calibration. Separate-source from calibration standards; Must contain all target analytes at the mid-range of the calibration curve ICV: 80-120% recovery.
Accuracy	Continuing Calibration Verification (CCV)	1 every 10 samples and at end of run Concentration level near mid-point of ICAL curve containing all target compounds; minimum RRF criteria met. % D of \leq 20% for all compounds.
Accuracy &	Method Blank (MB)	1 per batch - not to exceed 20 field samples

Sensitivity (Contamination)		MB: < RL
Analytical Accuracy/Bias (laboratory)	Laboratory Control Samples	1 per batch - not to exceed 20 field samples Must contain all target analytes and be matrix-specific; Evaluate against lab generated recovery limits.
Analytical Accuracy/Bias (laboratory)	Matrix Spike	1 per ≤20 field samples per matrix (when requested) Must be performed on a Site field sample & must contain all target analytes. Evaluate against lab generated recovery limits.
Analytical Accuracy/Bias (matrix interference)	Matrix Spike Duplicates	1 per ≤20 field samples per matrix (when requested) RPD: <30%
Accuracy	Surrogates	Every sample including QC Minimum of 3 surrogates. Evaluate recovery against lab generated limits.
Accuracy	Internal Standards (IS)	Every sample including QC. Minimum of 3 internal standards. Areas 50-200% of the most recent midpoint CCV standard. Retention times ±30 seconds from midpoint ICAL standard.
Accuracy (preservation)	Sample preservation	Soil/Sediment: < 6° C per SW-846 Chapter 3 Table 3-2 but allow for < 2° C if freezing samples are intact. Preserve per SW5035A within 48 hours of sampling.
Overall accuracy/bias (contamination)	Equipment Blanks	1 per 20 samples per matrix or 1 per day for non-dedicated sampling equipment No target analyte concentrations ≥ 1/2 LOQ
Completeness	See Worksheet #34	See Worksheet #34

QAPP Worksheet #12B: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(USEPA 2106-G-05 Section 2.2.6)

Laboratory: TAL
Matrix: Soil
Analytical Group or Method: Semi-volatile Organics, 8270D
Concentration Level: All

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Overall Precision	Field Duplicates	1 per 20 samples per matrix RPD \leq 30% when metals are detected in both samples \geq sample-specific LOQ
Accuracy	Tuning	Every 12 hours. Injection of DFTPP evaluated against method tune criteria (Table 3 of EPA 8270D)
Accuracy	Initial Calibration (ICAL)	Initially and when CCV fails Minimum 5-standards; must contain all targets and lowest standard \leq RL. % RSD \leq 20% for all compounds and minimum RF found in Table 4 of method or 'r' \geq 0.99.
Accuracy	Initial Calibration Verification (ICV)	Daily after calibration. Separate-source from calibration standards; Must contain all target analytes at the mid-range of the calibration curve ICV: 80-120% recovery.
Accuracy	Continuing Calibration Verification (CCV)	1 every 10 samples and at end of run Concentration level near mid-point of ICAL curve containing all target compounds; minimum RRF criteria met. % D of \leq 20% for CCCs and 30% for all other compounds.

Accuracy & Sensitivity (Contamination)	Method Blank (MB)	1 per batch - not to exceed 20 field samples MB: < RL
Analytical Accuracy/Bias (laboratory)	Laboratory Control Samples	1 per batch - not to exceed 20 field samples Must contain all target analytes and be matrix-specific; Evaluate against lab generated recovery limits.
Analytical Accuracy/Bias (laboratory)	Matrix Spike	1 per ≤20 field samples per matrix (when requested) Must be performed on a Site field sample & must contain all target analytes. Evaluate against lab generated recovery limits.
Analytical Accuracy/Bias (matrix interference)	Matrix Spike Duplicates	1 per ≤20 field samples per matrix (when requested) RPD:<30%
Accuracy	Surrogates	Every sample including QC Minimum of 3 base neutral and 3 acid surrogates. Evaluate recovery against lab generated limits.
Accuracy	Internal Standards (IS)	Every sample including QC. Minimum of 6 internal standards. Areas 50-200% of the most recent midpoint CCV standard. Retention times ±30 seconds from midpoint ICAL standard.
Accuracy (preservation)	Sample preservation	Soil/Sediment: < 6° C per SW-846 Chapter 3 Table 3-2 but allow for <2° C if freezing samples are intact
Overall accuracy/bias (contamination)	Equipment Blanks	1 per 20 samples per matrix or 1 per day for non-dedicated sampling equipment No target analyte concentrations ≥ 1/2 LOQ
Completeness	See Worksheet #34	See Worksheet #34

QAPP Worksheet #12C: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(USEPA 2106-G-05 Section 2.2.6)

Laboratory: TAL
Matrix: Soils and Water
Analytical Group or Method: Metals, 6010C
Concentration Level: All

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Overall Precision	Field Duplicates	1 per 20 samples per matrix RPD \leq 30% when metals are detected in both samples \geq sample-specific LOQ
Accuracy	Initial Calibration (ICAL)	Daily prior to sample analysis. Minimum of a calibration blank plus a standard per manufacturing recommended procedures; RL standard may be included in multipoint calibration curve; linear curve fit with correlation coefficient >0.998 .
Accuracy	Initial Calibration Verification (ICV)	Daily after calibration. Separate-source from calibration standards; Must contain all target analytes at the mid-range of the calibration curve ICV: 90-110% recovery.
Sensitivity	Low Level Initial CalibrationCheck Verification (LLICV)	At the beginning of the run before any samples and at the end of the run. Same source as calibration standards; must contain all target analytes at level of the RL LLCV: 70-130% recovery
Accuracy	Interference Check Standards (ICSA and ICSAB)	Daily after calibration.

		ICSA & ICSB: 80-120% recovery ICSA: non-spiked analytes < 2x RL
Accuracy	Continuing Calibration Verification (CCV)	1 every 10 samples and at end of run Same source as initial calibration standards; Must contain all target analytes at the mid-range of the calibration curve CCV: 90 - 110% recovery
Accuracy & Sensitivity (Contamination)	Method Blank (MB)	1 per digestion batch - not to exceed 20 field samples Must be digested with samples using same preparation method and amount of acids; MB: < RL
Analytical Precision (laboratory)	Sample Duplicates	1 per < 20 field samples if an MS/MSD was not performed RPD: <20% RPD aqueous; <35% solids; If results <5xRL: absolute difference between result and RL.
Analytical Accuracy/Bias (laboratory)	Laboratory Control Samples	1 per digestion batch - not to exceed 20 field samples Must contain all target analytes and be matrix-specific; Aqueous LCS: 80-120% recovery; Soil/Sediment/Solid LCS: vendor control limits (95% confidence limits)
Analytical Accuracy/Bias (laboratory)	Matrix Spike	1 per ≤20 field samples per matrix (when requested) Must be performed on a Site field sample & must contain all target analytes. 75-125% recovery (professional judgment if sample concentration is ≥ 4x spike concentration)
Analytical Accuracy/Bias (matrix interference)	Matrix Spike Duplicates	1 per ≤20 field samples per matrix (when requested) RPD: <20% RPD aqueous; <35% solids; If results <5xRL: absolute difference between result and RL.
Accuracy	Post-Digestion Spike	1 per < 20 field samples if less than acceptable accuracy and

		precision data are generated. Should be performed if MS/MSD recoveries were unacceptable: 80-120% recovery
Accuracy	Serial Dilution	1 per < 20 field samples if less than acceptable accuracy and precision data are generated Perform 5x dilution on same sample used for MS % Difference < 10% for results >10x RL.
Accuracy (preservation)	Sample preservation	Aq.: Total Metals: HNO3 pH < 2; (Dissolved Metals: filter on site or at the lab then HNO3 pH < 2 but cannot be used for regulatory compliance) Soil/Sediment: collect unpreserved per SW-846 Chapter 3 Table 3-2
Overall accuracy/bias (contamination)	Equipment Blanks	1 per 20 samples per matrix or 1 per day for non-dedicated sampling equipment No target analyte concentrations $\geq 1/2$ LOQ
Completeness	See Worksheet #34	See Worksheet #34

QAPP Worksheet #12D: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(USEPA 2106-G-05 Section 2.2.6)

Laboratory: TAL

Matrix: Soils

Analytical Group or Method: RA-226 by Gamma Spectroscopy, HASL 300-GA-01-R

Concentration Level: All

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Overall Precision	Field Duplicates	1 per 20 samples per matrix Relative Percent Difference (RPD) \leq 40%
Accuracy	Initial Calibration (ICAL) for Energy and FWHM	Annual calibration Within 0.5% or 0.1 KeV for all calibration points. Verified with second source that contains at least Am-241, Co-60, and Cs-137
Accuracy	Background	Monthly Acceptance criterion is 12 hours to determine background levels
Accuracy & Sensitivity (Contamination)	Method Blank (MB)	1 per batch - not to exceed 20 field samples MB: < RL
Analytical Accuracy/Bias (laboratory)	Laboratory Control Samples	1 per batch - not to exceed 20 field samples Must contain one isotope for low, mid, and high range energies; Evaluate against lab generated recovery limits.
Precision	Sample Duplicate	1 per \leq 20 field samples per matrix (when requested) Must be performed on a Site field sample Evaluate against lab generated precision limits.
Accuracy (preservation)	Sample preservation	Soil/Sediment: no preservation required

Completeness	See Worksheet #34	See Worksheet #34
--------------	-------------------	-------------------

QAPP Worksheet #12E: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(USEPA 2106-G-05 Section 2.2.6)

Laboratory: TAL

Matrix: Soils

Analytical Group or Method: Th-232 by Alpha Spectrometry, HASL 300-A-01-R

Concentration Level: All

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Overall Precision	Field Duplicates	1 per 20 samples per matrix Relative Percent Difference (RPD) \leq 40%
Accuracy	Energy Calibration and efficiency calibration and background check	Monthly Three isotopes in 3-6 meV range all within +/- 40 KeV of expected value. Greater than 20% efficiency.
Accuracy	Pulser check and background check	Daily Pulser energy, peak centroid, peak resolution, peak area, calibration and background must pass statistical "boundary" out-of-range test
Accuracy & Sensitivity (Contamination)	Method Blank (MB)	1 per batch - not to exceed 20 field samples MB: < RL
Analytical Accuracy/Bias (laboratory)	Laboratory Control Samples	1 per batch - not to exceed 20 field samples Evaluate against lab generated recovery limits.
Precision	Sample Duplicate	1 per \leq 20 field samples per matrix (when requested) Must be performed on a Site field sample Evaluate against lab generated precision limits.
Accuracy	Tracer	Every sample including QC

		Evaluate recovery against lab generated limits.
Accuracy (preservation)	Sample preservation	Soil/Sediment: no preservation required
Completeness	See Worksheet #34	See Worksheet #34

QAPP Worksheet #13: Secondary Data Uses and Limitations
(UFP-QAPP Manual Section 2.7)
(USEPA 2106-G-05 Chapter 3: QAPP Elements for Evaluating Existing Data)

Sources and types of secondary data include but are not limited to the following:

Data type	Source	Data uses relative to current project	Factors affecting the reliability of data and limitations on data use
Concentrations of metals in soil	Final Remedial Investigation Report (1999)	Comparison to metals concentrations in surface and subsurface soils.	NA
Concentrations of metals / grossly contaminated media in soil	Glen Isle Verification Program Certification Sampling Event #1 (2004)	Comparison to metals / grossly contaminated media concentrations in surface and subsurface soils.	NA
Concentrations of metals / grossly contaminated media in soil	Pre-Construction Confirmatory/Insurance Data Gap Subsurface Investigation Report (2014)	Comparison to metals / grossly contaminated media concentrations in surface and subsurface soils.	NA
Concentrations of metals in soil	Draft Contaminated Material Assessment Report (2015)	Comparison to metals concentrations in surface and subsurface soils.	NA
Concentrations of metals in soil	Leachable Arsenic and Lead Sampling Report (2015)	Comparison to metals concentrations in surface and subsurface soils.	NA
Concentrations of metals in soil	Pre-Construction Confirmatory/Insurance Data Gap Subsurface Investigation Report Addendum 1(2016)	Comparison to metals concentrations in surface and subsurface soils.	NA
Concentrations of metals in soil	Synthetic Precipitation Leaching Procedure Investigation/Red Flag Area Characterization Report (2016)	Comparison to metals concentrations in surface and subsurface soils.	NA

The project team has carefully evaluated the quality of secondary data (in terms of precision, bias, representativeness, comparability, and completeness) to ensure they are of the type and quality necessary to support their intended uses. When evaluating the reliability of secondary data and determining limitations on their uses, the project team will consider the source of the data, the time period during which they were collected, data collection methods, potential sources of uncertainty, the type of supporting documentation available, and the comparability of data collection methods to the currently proposed methods. With respect to secondary analytical data that will be utilized to support critical

decisions, such as comparison of contaminant levels with applicable standards, a detailed review of the data will be necessary to determine the usability of the data. In addition to the qualitative rating of the data source, the project team should complete a data quality review and document the review in a data usability summary. The protocol for completing the data usability report is provided in Worksheet 37.

In accordance with USEPA guidance documents *A Summary of General Assessment Factors for Evaluating the Quality of Scientific and Technical Information* (June 2003) and *Guidance for Evaluating and Documenting the Quality of Existing Scientific and Technical Information* (December 2012) (Appendix Q), the following assessment factors will be utilized to assess the quality and relevance of scientific and technical information:

1. Soundness – the extent to which the scientific and technical procedures, measures, methods or models employed to generate the information are reasonable for, and consistent with, the intended application.
2. Applicability and Utility – the extent to which the information is relevant for the Agency’s intended use.
3. Clarity and Completeness – the degree of clarity and completeness with which the data, assumptions, methods, QA, sponsoring organizations and analyses employed to generate the information are documented.
4. Uncertainty and Variability – the extent to which the variability and uncertainty (quantitative and qualitative) in the information or in the procedures, measures, methods or models are evaluated and characterized.
5. Evaluation and Review – the extent of independent verification, validation and peer review of the information or of the procedures, measures, methods or models.

QAPP Worksheet #14/16: Project Tasks & Schedule
(UFP-QAPP Manual Section 2.8.2)
(USEPA 2106-G-05 Section 2.2.4)

Activity	Responsible party	Planned start date	Planned completion date	Deliverable(s)	Deliverable due date
Project Initiation	USEPA/NYSDEC/PWGC/COGC	February 3, 2016	February 3, 2016	NA	NA
Develop SOW/QAPP	PWGC	February 3, 2016	March 21, 2016	SOW/QAPP	March 21, 2016
Mobilization/demobilization	PWGC/Contractor TBD	March 28, 2016	April 15, 2016	Field notes	NA
Sample collection Tasks	PWGC	March 28, 2016	April 15, 2016	Field notes	TBD
Analysis	TAL	March 29, 2016	April 15, 2016	Report of Analyses/Data package	1 Days from receipt
Validation	LDC	March 31, 2016	April 15, 2016	Validation Summary report	3 Days from receipt
Summarize data	PWGC	March 30, 2016	Daily or as needed	Daily Update/CCR	April 15, 2016

QAPP Worksheet #15: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(USEPA 2106-G-05 Section 2.2.6)

Matrix: Soil
Analytical Method: 6010C
Concentration level (if applicable): Low

Analyte	CAS Number	Remedial Action Removal Criteria (mg/kg)	Achievable Laboratory limits	
			Method Detection Limits (MDLs) (mg/kg)	Reporting Limits (RLs) (mg/kg)
Arsenic	7440-38-2	175	0.000983	0.003
Lead	7439-92-1	660	0.000785	0.002

Matrix: Soil
Analytical Method: 8260C
Concentration level (if applicable): Low

Analyte	CAS Number	Remedial Action Removal Criteria (mg/kg)	Achievable Laboratory limits	
			Method Detection Limits (MDLs) (mg/kg)	Reporting Limits (RLs) (mg/kg)
1,1,1-Trichloroethane	71-55-6		0.00038	0.001
1,1-Dichloroethane	75-34-3		0.00034	0.001
1,1-Dichloroethene	75-35-4		0.00041	0.001
1,2-Dichloroethane	107-06-2		0.00011	0.001
Cis-1,2-Dichloroethene	156-59-2		0.00022	0.001
Trans-1,2-Dichloroethene	156-60-5		0.00039	0.001
1,3-Dichlorobenzene	541-73-1		0.00012	0.001
1,4-Dichlorobenzene	106-46-7		0.00013	0.001
1,4-Dioxane	123-91-1		0.00639	0.02

Analyte	CAS Number	Remedial Action Removal Criteria (mg/kg)	Achievable Laboratory limits	
			Method Detection Limits (MDLs) (mg/kg)	Reporting Limits (RLs) (mg/kg)
Acetone	67-64-1		0.00106	0.005
Benzene	71-43		0.0002	0.001
n-Butylbenzene	104-51-8		0.00021	0.001
Carbon Tetrachloride	56-23-5		0.00043	0.001
Chlorobenzene	108-90-7		0.00014	0.001
Chloroform	67-66-3		0.00021	0.001
Ethylbenzene	100-41-4		0.00018	0.001
Methy Ethyl Ketone	78-93-3		0.00077	0.005
Methyl Tert-butyl Ether	1634-04-4		0.00017	0.001
Methylene Chloride	75-09-2		0.00032	0.001
n-Propylbenzene	103-65-1		0.00018	0.001
Sec-Butylbenzene	135-98-8		0.00017	0.001
Tert-Butylbenzene	98-06-6		0.00034	0.001
Tetrachloroethene	127-18-4		0.00028	0.001
Toluene	108-88-3		0.00019	0.001
1,2,4-Trimethylbenzene	95-636		0.00034	0.001
1,3,5-Trimethylbenzene	108-67-8		0.00013	0.001
Vinyl Chloride	75-01-4		0.00039	0.001
Xylenes (mixed)	1330-20-7		0.00011	0.002

Matrix: Soil
Analytical Method: 8270D
Concentration level (if applicable): Low

Analyte	CAS Number	Remedial Action Removal Criteria (mg/kg)	Achievable Laboratory limits	
			Method Detection Limits (MDLs) (mg/kg)	Reporting Limits (RLs) (mg/kg)
Acenaphthene	83-32-9		0.008	0.33
Acenaphthylene	208-96-8		0.0085	0.33
Anthracene	120-12-7		0.0314	0.33
Benzo(a)anthracene	56-55-3		0.0276	0.033
Benzo(a)pyrene	50-32-8		0.01	0.033
Benzo(b)fluoranthene	205-99-2		0.0129	0.033
Benzo(g,h,i)perylene	191-24-2		0.019	0.33
Benzo(k)fluoranthene	207-08-9		0.0144	0.033
Chrysene	218-01-9		0.009	0.33
Dibenzo(a,h)anthracene	53-70-3		0.0172	0.033
Fluoranthene	206-44-0		0.0098	0.33
Fluorene	86-73-7		0.0072	0.33
Hexachlorobenzene	118-74-1		0.0134	0.033
Indeno(1,2,3-cd)pyrene	193-39-5		0.022	0.033
m-Cresol	108-39-4		0.009	0.33
Naphthalene	91-20-3		0.0084	0.33
o-Cresol	95-48-7		0.0144	0.33
p-Cresol	106-44-5		0.009	0.33
Pentachlorophenol	87-86-5		0.04	0.266
Phenanthrene	85-01-8		0.0088	0.33

Analyte	CAS Number	Remedial Action Removal Criteria (mg/kg)	Achievable Laboratory limits	
			Method Detection Limits (MDLs) (mg/kg)	Reporting Limits (RLs) (mg/kg)
Phenol	108-95-2		0.0108	0.33
Pyrene	129-00-0		0.015	0.33

Matrix: Soil

Analytical Method: Alpha Spec and Gamma Spec

Concentration level (if applicable): Low

Analyte	CAS Number	Remedial Action Removal Criteria (pCi/g)	Achievable Laboratory limits	
			Method Detection Limits (MDLs) (pCi/g)	Target MDC (RLs) (pCi/g)
Thorium-232	7440-29-1	5	N/A	1.0
Radium-226	13982-63-3	5	N/A	1.0

QAPP Worksheet #17: Sampling Design and Rationale
(UFP-QAPP Manual Section 3.1.1)
(USEPA 2106-G-05 Section 2.3.1)

As part of the SOW, PWGC is tasked with the collection of post-excavation confirmatory samples. Samples will be collected to confirm achievement of Remedial Action Removal Criteria both horizontally and vertically. The samples collected will be submitted to an Environmental Laboratory Approval Program (ELAP) laboratory.

CONFIRMATORY SAMPLING

Following removal of impacted soils, confirmatory soil samples will be collected from each excavation area to confirm the effectiveness of remedial activities. Confirmatory soil samples will be collected in accordance with NYSDEC DER-10.

As specified in NYSDEC DER-10, verification sampling will consist of collecting confirmatory soil samples from within each excavation area. DER-10 specifies a sampling frequency of one bottom sample from each excavation for every 900 square feet of bottom, and one sidewall sample for every 30 linear feet of sidewall. A minimum of four sidewall samples and one bottom sample will be collected from each excavation area. Should the excavation expand, additional sidewall and bottom samples will be collected at the frequency specified above.

Confirmatory soil samples will be analyzed for the suite of constituents identified at each excavation as specified below:

- Metals remediation areas will be analyzed for arsenic and lead by USEPA Method 6010; and,
- Grossly contaminated media areas will be analyzed for VOCs by USEPA Method 8260 and SVOCs by USEPA Method 8270, in addition to arsenic and lead by USEPA Method 6010.
- If any areas exceed radiological action levels they will also be analyzed for radium-226 and thorium-232 by Method A-01-R-Isotopic Thorium (Alpha Spectrometry) and Method GA-01-R-Radium-226 & Other Gamma Emitters, as applicable.

Samples collected for volatile organic analysis will be collected utilizing tera-core sampling devices. The remaining sample volume will be transferred to a stainless steel bowl and homogenized. Once homogenized, samples will be transferred to laboratory supplied glassware, packed in a cooler with ice and shipped under proper chain-of-custody procedures to a New York State Department of Health (NYSDOH) ELAP certified laboratory for analysis in accordance with NYSDEC Analytical Services Protocol (ASP) Category B Data Deliverable packages and EDDs, in EQUIS format will be furnished by the laboratory.

All non-disposable sampling equipment used during field-sampling activities will be decontaminated in accordance to USEPA/Environmental Response Team (ERT) SOP #2006 prior to and subsequent to sampling (See Attachment B). Decontamination of sampling equipment will be conducted as follows:

1. Alconox detergent and potable water scrub.
2. Potable water rinse.
3. Deionized water rinse.
4. Air dry (sufficient time will be allowed for the equipment to completely dry).
5. Deionized water rinse and air dry.

Management of Investigation Derived Waste

Waste materials generated from the field operations may consist of decontamination water and miscellaneous solid materials such as personal protective equipment and supplies. Investigative derived waste generated during field operations will be disposed of in accordance with applicable regulations.

Decontamination water generated during the field activities will be stored in 55-gallon drums. Drums will be labeled to indicate the source of the fluid and will be stored in a designated area onsite. Drummed liquids will be sampled to determine if discharge to the surface of the site is appropriate or off-site disposal is required. Following receipt of the liquid sampling results, recommendations for disposition of the water will be provided to USEPA/NYSDEC.

QAPP Worksheet #18: Sampling Locations and Methods
(UFP-QAPP Manual Section 3.1.1 and 3.1.2)
(USEPA 2106-G-05 Section 2.3.1 and 2.3.2)

Sample ID	Matrix ¹	Depth (feet bgs)	Type	Analyte/ Analytical Group	Sampling SOP	Comments
Confirmatory Samples	Soil	Varies	Hand Auger	See Worksheet 17	See Worksheet 17	

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times
(UFP-QAPP Manual Section 3.1.2.2)
(USEPA 2106-G-05 Section 2.3.2)

Laboratory: TAL
Address: 777 New Durham Road, Edison, NJ 08817
Contact: John Schove
Email: john.schove@testamericainc.com
Phone: 716-504-9838

List any required accreditations/certifications: NYSDEC ELAP

Back-up Laboratory: American Analytical Laboratories

Sample Delivery Method: Courier

Analyte/ Analyte Group	Matrix	Method/ SOP	Accreditation Expiration Date	Container(s) (number, size & type per sample)	Preservation	Preparation Holding Time	Analytical Holding Time	Data Package Turnaround
As, Pb	Soil	EPA 6010C	01 Apr 2016	4 oz, amber glass	Metals ex.	6 months	6 months	1 Day
VOCs	Soil	EPA 8260C	01 Apr 2016	3 x 40 ml VOA vial	1 x Methanol 2 x DI H2O	48 hours	14 Days	1 Day
SVOCs	Soil	EPA 8270D	01 Apr 2016	4 oz, amber glass	Cool $\leq 6^{\circ}\text{C}$	14 Days	14 Days	1 Day
Ra-226 / Gamma Spec	Soil	HASL 300 GA-01-R	30 June 2016	32 oz, plastic	None	None	180 days	30 days
Th-232 / Alpha Spec	Soil	HASL 300 A- 01-R	30 June 2016	4 oz, plastic	None	None	180 days	30 days

QAPP Worksheet #20: Field QC Summary
(UFP-QAPP Section 3.1.1 and 3.1.2)
(USEPA 2106-G-05 Section 2.3.5)

[illegible]

QAPP Worksheet #21: Field SOPs
(UFP-QAPP Manual Section 3.1.2)
(USEPA 2106-G-05 Section 2.3.2)

SOP # or reference	Title, Revision, Date, and URL (if available)	Originating Organization	SOP option or Equipment Type (if SOP provides different options)	Modified for Project? Y/N	Comments
2001	General Field Sampling Guidelines, Revision 0, August 11, 1994	ERT – USEPA	NA	N	
2006	Sampling Equipment Decontaminations, Revision 0, August 11, 1994	ERT – USEPA	NA	N	

QAPP Worksheet #22: Field Equipment Calibration, Maintenance, Testing, and Inspection
(UFP-QAPP Manual Section 3.1.2.4)
(USEPA 2106-G-05 Section 2.3.6)

Field Equipment	Activity	SOP Reference	Title or position of responsible person	Frequency	Acceptance Criteria	Corrective Action
Photo-ionization Detector	Screening	Manufacturer Reference	PWGC FTL	Check daily before each use	Pass/fail	Return to rental company for replacement
Dust Meter	Monitoring	Manufacturer Reference	PWGC FTL	Check daily before each use	Pass/Fail	Return to rental company for replacement

QAPP Worksheet #23: Analytical SOP's
(UFP-QAPP Manual Section 3.2.1)
(USEPA 2106-G-05 Section 2.3.4)

Laboratory: TAL

SOP #	Title, Date, and URL (if available)	Definitive or Screening Data	Matrix/Analytical Group	SOP Option or Equipment Type	[‡] Modified for Project? Y/N
ED-MT-004	Trace Metals Analysis by Inductively Coupled Plasma Emission Spectroscopy by using SW846 Method 6010B and 6010C	Definitive	Soil and Aqueous/Metals	ICP-AES	N
ED-MTP-005	Hot Block Digestion of Sediments, Sludges, and Soils using SW846 Method 3050B	Definitive	Soil/Metals	Prep	N
ED-MTP-003	Digestion of Water and Wastewater Samples for Analysis by ICP using Method 3010A	Definitive	Soil/Aqueous	Prep	N
ED-MSV-014	SW846 Method 8260C Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry	Definitive	Soil and Aqueous/Volatile Organics	Purge and Trap GC-MS	N

SOP #	Title, Date, and URL (if available)	Definitive or Screening Data	Matrix/Analytical Group	SOP Option or Equipment Type	[‡] Modified for Project? Y/N
ED-MSV-002	SW846 Method 5035A, Closed System Purge and Trap and Extraction for Volatile Organics in Soil	Definitive	Soil/Volatile Organics	Prep	N
ED-MSV-001	Purge and Trap for Aqueous Samples Method 5030, SW846	Definitive	Aqueous/Volatile Organics	Prep	N
ED-MSS-009	SW8270D, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)	Definitive	Soil and Aqueous/Semivolatile Organics	GC/MS	N
ED-ORP-044	SW846 Method 3546: Microwave Extraction of Solids	Definitive	Soil/Semivolatile Organics	Prep	N

SOP #	Title, Date, and URL (if available)	Definitive or Screening Data	Matrix/Analytical Group	SOP Option or Equipment Type	[‡] Modified for Project? Y/N
ED-ORP-002	SW846 Method 3510C-Extraction of Semi-Volatile Organic Compounds in Water by Separatory Funnel	Definitive	Aqueous/Semivolatile Organics	Prep	N
ST-RC-0025	Preparation of Samples for Gamma Spectroscopy	Definitive	Soil/Gamma Spec	Prep	N
ST-RD-0102	GammaVision Analysis	Definitive	Soil/Gamma Spec	Gamma Spec	N
ST-RC-0232	Isotopic Thorium in Various Matrices by Eichrom TEVA Separation Resin	Definitive	Soil/Alpha Spec	Prep	N
ST-RD-0210	Alpha Spectroscopy Analysis	Definitive	Soil/Alpha Spec	Alpha Spec	N

QAPP Worksheet #24: Analytical Instrument Calibration
(UFP-QAPP Manual Section 3.2.2)
(USEPA 2106-G-05 Section 2.3.6)

Laboratory: TAL

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/position responsible for Corrective Action	SOP Reference
Metals	1) Initial calibration (ICAL) 2) Initial Calibration Verification (ICV) (second source) 3) Continuing Calibration Verification (CCV)	2.0-250000 ppb (varies by analyte)	1) Daily 2) After ICAL before sample analysis 3) At the beginning and end of analysis and after every 10 samples	1) Correlation \geq 0.998 2) Within +/- 10% of the true value 3) Within +/- 10% of the true value	All: Table 2 of SOP.	Analyst/Department Manager	ED-MT-004
GC/MS (Semivolatiles)	1) MS Tuning Check (BFB) 2) Initial calibration (ICAL) 3) Initial Calibration Verification (ICV) (second source) Continuing Calibration Verification (CCV)	ICAL range = 5-120 ppm	1) 12 hours 2) Initially and as needed. 3) After ICAL 12 hours (after tuning check)	1) Criteria outlined in Sec. 9.2.1 of SOP. 2) Criteria outlined in Sec. 9.2.4.2 of SOP. 3) Criteria outlined in Sec. 9.2.4.3 of SOP. Criteria outlined in Sec. 9.2.4.2 of SOP.	1) Outlined in Sec. 9.2.1 of SOP. 2) Outlined in Sec. 9.2.4.2 of SOP. 3) Outlined in Sec. 9.2.4.3 of SOP. Outlined in Sec. 9.2.4.2 of SOP.	Analyst/Department Manager	ED-MSS-009
GC/MS (Volatiles)	1) MS Tuning Check (BFB) 2) Initial calibration (ICAL) 3) Initial Calibration Verification (ICV) (second source) 4) Continuing Calibration Verification (CCV)	ICAL range 0.5-500 ppb	1) 12 hours 2) Initially and as needed. 3) After ICAL 12 hours (after tuning check)	1) Criteria outlined in Sec. 9.2.1 of SOP. 2) Criteria outlined in Sec. 9.2.4.2 of SOP. 3) Criteria outlined in Sec. 9.2.4.3 of SOP. Criteria outlined in Sec. 9.2.4.2 of SOP.	1) Outlined in Sec. 9.2.1 of SOP. 2) Outlined in Sec. 9.2.4.2 of SOP. 3) Outlined in Sec. 9.2.4.3 of SOP. Outlined in Sec. 9.2.4.2 of SOP.	Analyst/Department Manager	ED-MSV-014
Gamma Spec	1. Energy calibration 2. FWHM calibration 5) Background	N/A	1. Annual 2. Annual 3. Monthly 4)	For Energy and FWHM calibration: <ul style="list-style-type: none"> Within 0.5% or 0.1 KeV for all calibration points 	<ul style="list-style-type: none"> Recalibrate Instrument maintenance 4) Consult with Technical Director	TestAmerica – St. Louis Group Leader	ST-RD-0102

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/position responsible for Corrective Action	SOP Reference
				<ul style="list-style-type: none"> • Within 8% for all calibration points • Verify with second source that always contains at least Am-241, Co-60, and Cs-137 • Must be $\pm 10\%$D for each nuclide <p>4) For Background, acceptance criterion is 12 hours</p>			
Alpha Spec	1. Energy calibration 2. Efficiency calibration and background check 3. Subtraction spectrum 6) Pulser check and background check	N/A	1. Monthly 2. Monthly 3. Monthly 4. Daily 5)	1. Three isotopes in 3–6 MeV range all within ± 40 KeV of expected value 2. $>20\%$ 3. Ultra Low Level: < 2 CPM Low Level: $< 2-4$ CPM Routine Level: $< 4-10$ CPM High Level: $< 10-20$ CPM 5) Pulser energy, peak centroid, peak resolution, peak area, calibration and background must pass statistical “boundary” out-of-range test	<ul style="list-style-type: none"> • Recalibrate • Instrument maintenance • Consult with Technical Director <p>5) • If background check is > 20 CPM, then detector requires maintenance</p>	TestAmerica – St. Louis Group Leader	ST-RC-0210

QAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection
(UFP-QAPP Manual Section 3.2.3)
(USEPA 2106-G-05 Section 2.3.6)

Laboratory: TAL

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Title/position responsible for corrective action	Reference
Gas Chromatograph/ Mass Spectrometer (GC.MS) (VOA and SVOA)	-Dust around instrument and instrument surface. -Check all fans and clean filter -Remove syringe, clean, reinstall or replace (SVs) -Remove all glassware and acid wash(VOC)	NA	NA	Monthly	Per SOP	Per SOP	Analyst	ED-MSS-009 ED-MSV-014
	-Replace roughing pump oil -Replace aux pump oil (VOC)	NA	NA	Every 6 months				

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Title/position responsible for corrective action	Reference
	-Replace forline trap absorbent. -Lubricate turbo pump -Methanol rinse Tekmar (VOC) -Renew chemical filter -Clean injection port -Clean source -Change Column Change trap	NA NA	NA NA	Yearly As needed				
Inductively Coupled Plasma (ICP) (Metals)	Perform leak test, change pump tubing, change torch and window, clean filters	Monitor instrument performance via CCV and CCB	Monitor instrument performance via CCV and CCB	Daily, after every 10 samples	Per Laboratory SOP	Replace pump tubing, replace torch and window, clean all filters	Laboratory analyst	ED-MT-004
Gas Chromatograph	Compare standard response to previous day	Monitor instrument performance via CCV and CCB,	As required	Daily	Per Laboratory SOP	Replace Septa, Clean and replace Injection Port Liner, Replace or clip Guard and or	Laboratory Analyst	ED-GCS-016

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Title/position responsible for corrective action	Reference
	or since last initial calibration Check carrier gas flow rate in column Check temp. of detector, inlet, column oven					analytical Columns Clean Detector		
Gamma Spectrometer	1. Clean cave; fill dewar with N ₂ QA check	1. Physical check 2. Background and source check	1. Physical check Check deviation	1. Weekly Daily	1. Acceptable background Within 3 sigma of measured population	<ul style="list-style-type: none"> Recalibrate Instrument maintenance Consult with Technical Director	TestAmerica – St. Louis Group Leader / Analyst	ST-RD-0102
Alpha Spectrometer	Clean planchette holders	Physical check	Physical check	Monthly	Acceptable background and calibration efficiencies	<ul style="list-style-type: none"> Recalibrate Instrument maintenance Consult with Technical Director	TestAmerica – St. Louis Group Leader / Analyst	ST-RC-0210

QAPP Worksheet #26 & 27: Sample Handling, Custody, and Disposal
(UFP-QAPP Manual Section 3.3)
(USEPA 2106-G-05 Section 2.3.3)

Sampling Organization: PWGC

Laboratory: TAL

Method of sample delivery (shipper/carrier): Laboratory Courier

Number of days from reporting until sample disposal: 90

Activity	Organization and title or position of person responsible for the activity	Protocol
Sample labeling	PWGC/FTL	See Below
Chain-of-custody form completion	PWGC/FTL	See Below
Packaging	PWGC/FTL	See Below
Shipping coordination	PWGC/PM	See Below
Sample receipt, inspection, & log-in	TAL/Sample Receipt Tech	See Below
Sample custody and storage	TAL/Lab Team Leader	See Below
Sample disposal	TAL/Lab Waste Manager	See Below

Sample Collection: PWGC staff will collect all samples. Sample numbers will be assigned as described below. A coding system will be used to identify each sample collected during the duration of the project. This coding system will provide a tracking record to allow retrieval of information about a particular sample and ensure that each sample is uniquely identified. Each sample is identified by a unique code which indicates the sample type, sample number, and, in some cases, sample depth. A sample numbering system is described below which provides a unique identifier for all samples that will be collected during the site field investigation. The total number and types of samples collected are detailed in Worksheet #18.

Sample Packaging: Qualified PWGC personnel will perform the sample packaging. Samples will be packed in dedicated coolers and ice added in double sealed Ziploc bags when necessary for preservation. This task will be assigned to experienced field personnel.

Coordination of Shipment: FTL, PWGC and Lab coordinator.

Type of Shipment/Carrier: Laboratory Couriers will drop off empty sample jars at the site and pick up completed samples at the site.

SAMPLE RECEIPT AND ANALYSIS

Sample Receipt (Personnel/Organization): Laboratory Sample Custodian - TBD. The Laboratory assignment sheet will indicate the laboratory sample custodian, and if a subcontract laboratory is required. The laboratory project officer will notify the field team of the laboratory sample custodian.

Sample Custody and Storage (Personnel/Organization): TBD

Sample Preparation (Personnel/Organization): TBD

Sample Determinative Analysis (Personnel/Organization): TBD

SAMPLE ARCHIVING

Field Sample Storage (No. of days from sample collection): All samples will be shipped to a laboratory or a subcontract laboratory on the day of collection via laboratory courier.

Sample Extract/ Digestate Storage (No. of days from extraction/digestion): Refer to Worksheet #19 for holding time requirements

SAMPLE DISPOSAL

Laboratory responsible for analysis will dispose of samples in accordance with the applicable regulations.

Number of Days from Analysis: 90 days

Sample Identification Procedures: Each sample will be labeled with a specific sample ID that depicts a specific location. Depending on the type of sample, additional information such as depth, sampling round, date, etc. will be added.

Examples are provided below.

Confirmatory Soil Samples

Samples will be named Excavation Location - Sample Location - Sample Number. An example would be CC-C-019_N_001.

Field Blanks

Field blanks will be named FB- MMDDYYYY- identifier, where FB refers to field blank, MMDDYYYY refers to the date, and the identifier will be added to identify what type of equipment the field blank was collected from. An example would be FB-09052011-P (P refers to pump).

Additional Notes

Duplicates will use the same sampling scheme as described for each media above, however the sample # will be modified by adding a 90 before the number.

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):

Packaging for all shipments will be performed as detailed above. To maintain a record of sample collection, transfer between field personnel, shipment, and receipt by the laboratory, the applicable sample chain-of-custody paperwork is completed for each shipment (i.e., cooler) of packed sample bottles. The team member actually performing the sampling is personally responsible for the care and custody of the samples collected until they are transferred properly. The field technician will review all field sampling activities to confirm that proper custody procedures were followed during the field work. PWGC personnel relinquishing the sample to the courier will sign the chain of custody record.

All courier receipts and/or paperwork associated with the shipment of samples will serve as a custody record for the samples while they are in transit from the field to the laboratory. Custody seals should remain intact during this transfer.

Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal): A sample custodian at the laboratory will accept custody of shipped samples, and check them for discrepancies, proper preservation, integrity, etc. If noted, issues will be forwarded to the laboratory manager for corrective action. The sample custodian will relinquish custody to the appropriate department for analysis. Samples may be archived at the laboratory if sufficient sample volume exists following initial analysis. Disposal of the samples will occur only after analyses and QA/QC checks are completed. This will complete sample transfer.

It will be each laboratory's responsibility to maintain internal logbooks and records that provide a custody record throughout sample preparation and analysis. To track field samples through data handling, the subcontractors responsible for sampling will maintain photocopies of all chain-of-custody forms.

QAPP Worksheet #28a: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(USEPA 2106-G-05 Section 2.3.5)

Laboratory: TAL

Matrix: Soils

Analytical Group: Metals

Analytical Method/SOP: SW-846 6010C/SOP# ED-MT-004

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
ICV/CCV	Once per calibration; every ten samples afterwards	90-110%; 90-110% on continuing	Rerun once; recalibrate on continued failure	Analyst	Accuracy
ICB/CCB	Once per calibration; every ten samples afterwards	< RL; > 2x RL if below zero	Rerun once; recalibrate on continued failure	Analyst	Accuracy
CRI	Once per calibration	70-130%	Rerun once; recalibrate on continued failure	Analyst	RL Accuracy
Method Blank	1/batch	< RL, > 2x RL if below zero	Rerun once, re-digest batch on continued failure	Analyst	Accuracy

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
LCS	1/batch	80-120% for aqueous; Vendor limits for soils	Rerun once, re-digest batch on continued failure	Analyst	Accuracy
Matrix Spike	1/20 samples	75-125%	Narrate	Analyst	Accuracy
Post Spike	1/20 samples	80-120%	Narrate	Analyst	Accuracy
Sample Duplicate	1/20 samples	≤ 20% RPD	Narrate	Analyst	Precision

QAPP Worksheet #28b: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(USEPA 2106-G-05 Section 2.3.5)

Matrix: Soil

Analytical Group: VOA

Analytical Method/SOP: SW-846 8260C/SOP No. ED-MSV-014

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Method Blank	1/batch	<RL, Common contaminants (acetone, methylene chloride, MEK) must be <5x RL	Reanalyze. Report non- conformances in narrative. 'B' flag as needed.	Analyst	Accuracy
LCS	1/batch	Recoveries within lab generated limits.	Reanalyze if necessary, qualify data and narrate.	Analyst	Accuracy
Matrix Spike	1/20 samples	Recoveries within lab generated limits.	Reanalyze if necessary, qualify data and narrate	Analyst	Accuracy
Matrix Spike Duplicate	1/20 samples	≤ 30% RPD	Narrate	Analyst	Precision

QAPP Worksheet #28c: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(USEPA 2106-G-05 Section 2.3.5)

Laboratory: Test America Laboratories, Inc.

Matrix: Soil

Analytical Group: SVOCs

Analytical Method/SOP: SW-846 8270D/SOP# ED-MSS-009

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
ICV/CCV	Once/Calibration, every ten samples afterwards	80-120%	Rerun once, recalibrate on continued failure	Analyst	Accuracy
Method Blank	1/batch	<RL, Common contaminants (phthalates) must be <5x RL	Reanalyze. Report non- conformances in narrative. 'B' flag as needed.	Analyst	Accuracy
LCS	1/batch	Recoveries within lab generated limits.	Reanalyze if necessary, qualify data and narrate.	Analyst	Accuracy
Matrix Spike	1/20 samples	Recoveries within lab generated limits.	Reanalyze if necessary, qualify data and narrate	Analyst	Accuracy

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Matrix Spike Duplicate	1/20 samples	≤ 30% RPD	Narrate	Analyst	Precision

QAPP Worksheet #28d: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(USEPA 2106-G-05 Section 2.3.5)

Laboratory: Test America Laboratories, Inc.

Matrix: Soil

Analytical Group: Gamma Spec

Analytical Method/SOP: HASL 300-GA-01-R/SOP No. ST-RD-00102

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Method Blank	1/batch	<RL	Reanalyze. Report non-conformances in narrative.	Analyst	Accuracy
LCS	1/batch	Recoveries within lab generated limits.	Reanalyze if necessary, qualify data and narrate.	Analyst	Accuracy
Sample Duplicate	1/20 samples	≤ 40% RPD	Narrate	Analyst	Precision

QAPP Worksheet #28e: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(USEPA 2106-G-05 Section 2.3.5)

Laboratory: Test America Laboratories, Inc.

Matrix: Soil

Analytical Group: Alpha Spec

Analytical Method/SOP: HASL 300-A-01-R/SOP No. ST-RD-0201

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Method Blank	1/batch	<RL	Reanalyze. Report non-conformances in narrative.	Analyst	Accuracy
LCS	1/batch	Recoveries within lab generated limits.	Reanalyze if necessary, qualify data and narrate.	Analyst	Accuracy
Tracer	Every Sample	Recoveries within lab generated limits.	Reanalyze if necessary, qualify data and narrate.	Analyst	Accuracy
Sample Duplicate	1/20 samples	≤ 40% RPD	Narrate	Analyst	Precision

QAPP Worksheet #29: Project Documents and Records
(UFP-QAPP Manual Section 3.5.1)
(USEPA 2106-G-05 Section 2.2.8)

Sample Collection and Field Records			
Record	Generation	Verification	Storage location/archival
Field logbook or data collection sheets	PWGC FTL	PWGC PM	Project File
Chain-of-Custody Forms	PWGC FTL	PWGC PM	Project File
Photo-documentation	PWGC FTL	PWGC PM	Project File

Project Assessments			
Record	Generation	Verification	Storage location/archival
Data validation report	Data Validator	PWGC PM	Project File
Data usability assessment report	Data Validator	PWGC PM	Project File

QAPP Worksheet #31, 32 & 33: Assessments and Corrective Action
(UFP-QAPP Manual Sections 4.1.1 and 4.1.2)
(USEPA 2106-G-05 Section 2.4 and 2.5.5)

Assessments:

Assessment Type	Frequency	Internal or External	Organization Performance Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing Corrective Actions	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions
Laboratory Technical Systems/Performance Audits	TBD	External	PWGC/USEPA/NYSDEC	TBD	TAL	TAL	PWGC/USEPA/NYSDEC
Performance Evaluation Samples	TBD	External	PWGC/USEPA/NYSDEC	TBD	TAL	TAL	PWGC/USEPA/NYSDEC
Sample Collection and Documentation	Once	Internal	PWGC	TBD	TBD	TBD	PWGC
Health and Safety	Once If warranted	Internal	PWGC	TBD	TBD	TBD	PWGC
Field Audit	Once	Internal	PWGC	TBD	TBD	TBD	PWGC
Data Review	Once	Internal	PWGC	TBD	TBD	TBD	PWGC

Assessment Response and Corrective Action:

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response	Timeframe for Response
Laboratory Technical Systems/Performance Audits	Written Report	Laboratory Manager & PWGC	30 days	Letter	TAL	14 days
Performance Evaluation Samples	Electronic Report	Laboratory Manager & PWGC	30 days	Letter or Written Report	TAL	14 days
Project Readiness Review	Checklist or logbook entry	PWGC FTL	Immediately to within 24 hours of review	Checklist or logbook entry	PWGC FTL	Immediately to within 24 hours of review
Field Observations/Deviations from work plan	Logbook	PWGC FTL	Immediately to within 24 hours of deviation	Logbook	PWGC FTL	Immediately to within 24 hours of deviation
On-Site Field Inspection	Written Report	PWGC FTL	7 calendar days after completion of the audit	Letter/Internal Memorandum	PWGC FTL	To be identified in the cover letter of the report
Health and Safety	Audit Checklist	PWGC PM	Notify by phone immediately	Memorandum and checklist	PWGC Health & Safety Manager	10-30 days from notice
Field Audit	Field Audit Report	PWGC PM	Provide summary of findings to field team on day of audit	Corrective Action Plan	PWGC QA Manager	
Data Review	Memorandum	Data Validator	Notify by phone – 24 hours	Memorandum	PWGC PM	TBD

QAPP Worksheet #34: Data Verification and Validation Inputs
(UFP-QAPP Manual Section 5.2.1 and Table 9)
(USEPA 2106-G-05 Section 2.5.1)

Item	Description	Verification (completeness)	Validation (conformance to specifications)
Planning Documents/Records			
1	Approved QAPP	X	
2	Field SOPs	X	
3	Laboratory SOPs	X	
Field Records			
4	Field logbooks	X	X
5	Equipment calibration records	X	X
6	Chain-of-Custody Forms	X	X
7	Sampling diagrams/surveys	X	X
8	Drilling logs	X	X
9	Relevant Correspondence	X	X
10	Field audit reports	X	X
11	Field corrective action reports	X	X
Analytical Data Package			
12	Cover sheet (laboratory identifying information)	X	X
13	Case narrative	X	X
14	Internal laboratory chain-of-custody	X	X
15	Sample receipt records	X	X
16	Sample chronology (i.e. dates and times of receipt, preparation, & analysis)	X	X
17	Communication records	X	X
18	Project-specific PT sample results	X	X
19	LOD/LOQ establishment and verification	X	X
20	Standards Traceability	X	X
21	Instrument calibration records	X	X
22	Definition of laboratory qualifiers	X	X
23	Results reporting forms	X	X
24	QC sample results	X	X
25	Corrective action reports	X	X
26	Raw data	X	X
27	Electronic data deliverable	X	X

QAPP Worksheet #35: Data Verification Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Records Reviewed	Requirement Documents	Process Description	Responsible Person, Organization
Field logbook	QAPP	Verify that records are present and complete for each day of field activities. Verify that all planned samples including field QC samples were collected and that sample collection locations are documented. Verify that meteorological data were provided for each day of field activities. Verify that changes/exceptions are documented and were reported in accordance with requirements. Verify that any required field monitoring was performed and results are documented.	Daily – PWGC PM At conclusion of field activities - Project QA Manager
COC forms	QAPP	Verify the completeness of chain-of-custody records. Examine entries for consistency with the field logbook. Check that appropriate methods and sample preservation have been recorded. Verify that the required volume of sample has been collected and that sufficient sample volume is available for QC samples (e.g., MS/MSD). Verify that all required signatures and dates are present. Check for transcription errors.	Daily – PWGC FTL At conclusion of field activities - Project Chemist

Laboratory Deliverable	QAPP	Verify that the laboratory deliverable contains all records specified in the QAPP. Check sample receipt records to ensure sample condition upon receipt was noted, and any missing/broken sample containers were noted and reported according to plan. Compare the data package with the COCs to verify that results were provided for all collected samples. Review the narrative to ensure all QC exceptions are described. Check for evidence that any required notifications were provided to project personnel as specified in the QAPP. Verify that necessary signatures and dates are present.	Before release – Laboratory QA Manager Upon receipt - Project Chemist
Audit Reports, Corrective Action Reports	QAPP	Verify that all planned audits were conducted. Examine audit reports. For any deficiencies noted, verify that corrective action was implemented according to plan.	Project QA Manager

QAPP Worksheet #36
Data Validation Procedures
(UFP-QAPP Manual Section 5.2.2)
(USEPA 2106-G-05 Section 2.5.1)

Data Validator: LDC

Analytical Group/Method:	Volatile Organics – SW-846 8260	Semivolatile Organics – SW-846 8270	Metals – SW-846 6010
Data deliverable requirements:	Category B (pdf)	Category B (pdf)	Category B (pdf)
Analytical specifications:	WS 28-1	WS-28-2	WS 28-3
Measurement performance criteria:	WS 12	WS 12	WS 12
Percent of data packages to be validated:	100%	100%	100%
Percent of raw data reviewed:	100%	100%	100%
Percent of results to be recalculated:	10%	10%	10%
Validation procedure:	EPA Region 2 – Category B	EPA Region 2 – Category B	EPA Region 2 – Category B
Validation code (*see attached table):	S4VM	S4VM	S4VM
Electronic validation program/version:	Not applicable	Not applicable	Not applicable

Validation Code and Label Identifier Table (To be attached to the QAPP)

Validation Code*	Validation Label	Description/Reference
S1VE	Stage 1 Validation Electronic	EPA 540-R-08-005
S1VM	Stage 1 Validation Manual	EPA 540-R-08-005
S1VEM	Stage 1 Validation Electronic and Manual	EPA 540-R-08-005
S2aVE	Stage 2a Validation Electronic	EPA 540-R-08-005

S2aVM	Stage 2a Validation Manual	EPA 540-R-08-005
S2aVEM	Stage 2a Validation Electronic and Manual	EPA 540-R-08-005
S2bVE	Stage 2b Validation Electronic	EPA 540-R-08-005
S2bVM	Stage 2b Validation Manual	EPA 540-R-08-005
S2bVEM	Stage 2b Validation Electronic and Manual	EPA 540-R-08-005
S3VE	Stage 3 Validation Electronic	EPA 540-R-08-005
S3VM	Stage 3 Validation Manual	EPA 540-R-08-005
S3VEM	Stage 3 Validation Electronic and Manual	EPA 540-R-08-005
S4VE	Stage 4 Validation Electronic	EPA 540-R-08-005
S4VM	Stage 4 Validation Manual	EPA 540-R-08-005
S4VEM	Stage 4 Validation Electronic and Manual	EPA 540-R-08-005
NV	Not Validated	EPA 540-R-08-005

The following data qualifiers will be applied during data validation by a third party. Potential impacts on project-specific data quality objectives will be discussed in the data validation report.

- U - The analyte was analyzed for, but due to blank contamination was flagged as nondetect (U). The result is usable as a nondetect.
- J - Data are flagged (J) when a QC analysis fails outside the primary acceptance limits. The qualified “J” data are not excluded from further review or consideration. However, only one flag (J) is applied to a sample result, even though several associated QC analyses may fail. The ‘J’ data may be biased high or low or the direction of the bias may be indeterminable.
- UJ - The analyte was not detected above the reported sample quantitation limit. Data are flagged (UJ) when a QC analysis fails outside the primary acceptance limits. The qualified “UJ” data are not excluded from further review or consideration. However, only one flag is applied to a sample result, even though several associated QC analyses may fail. The ‘UJ’ data may be biased low.
- JN - The analysis indicates the presence of a compound that has been “tentatively identified” (N) and the associated numerical value represents its approximate (J) concentration.

- R - Data rejected (R) on the basis of an unacceptable QC analysis should be excluded from further review or consideration. Data are rejected when associated QC analysis results exceed the expanded control limits of the QC criteria. The rejected data are known to contain significant errors based on documented information. The data user must not use the rejected data to make environmental decisions. The presence or absence of the analyte cannot be verified.

QAPP Worksheet #37: Data Usability Assessment
(UFP-QAPP Manual Section 5.2.3 including Table 12)
(USEPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used: The Data Usability Assessment will be performed by a team of personnel at LDC. LDC will be responsible for information in the Usability Assessment and will also be responsible for assigning task work to the individual task members who will be supporting the Data Usability Assessment. Note that the Data Usability Assessment will be conducted on validated data. After the Data Usability Assessment has been performed, data deemed appropriate for use will then be used in the *SI Report*. The results of the Data Usability Assessment will be presented in the project-specific report. The following items will be assessed and conclusions drawn based on their results.

Precision – Results of laboratory duplicates will be assessed during data validation and data will be qualified according to the data validation procedures cited on Worksheet #36. Field duplicates will be assessed by matrix using the RPD for each pair of results reported above CRQL for organic and inorganic analyses respectively. RPD acceptance criteria, presented in Worksheet #12, will be used to assess field sampling precision. Absolute difference will be used for low results as described in worksheets 12 and 28. A discussion summarizing the results of laboratory and field precision and any limitations on the use of the data will be described.

Field duplicates – The data validator will review the extent of exceedance of the field duplicate criteria. For groundwater, the sample results will be flagged according to the data validation protocol. For soils, the exceedances will be compared with the field lithological logs and grain size results, if available. Based on this review, the project manager will determine whether the exceedance is due to inherent soil heterogeneity or the result of sample handling in the field or laboratory. This information will be included in the data assessment report. As an added measure, the field team leader will be asked to inspect the soil coning and quartering procedures and re-train staff if needed. The data assessor will review the data validation report. If the field duplicate comparison is not included, it will be performed by the assessor.

Accuracy/Bias Contamination –Laboratory blank results will be assessed as part of data validation. During the data validation process the validator will qualify the data following the procedures listed on Worksheet #36. A discussion summarizing the results of laboratory accuracy and bias based on contamination will be presented and limitations on the use of the data will be described.

Overall Accuracy/Bias – The results of instrument calibration and matrix spike recoveries will be reviewed and data will be qualified according to the data validation procedures cited on Worksheet #36. A discussion summarizing the results of laboratory accuracy and any limitations on the use of the data will be described.

Sensitivity – Data results will be compared to criteria provided on Worksheet #15. A discussion summarizing any conclusions about sensitivity of the analyses will be presented and any limitations on the use of the data will be described.

Representativeness – A review of adherence to the sampling plan, field procedures and of project QA audits will be performed in order to assess the representativeness of the sampling program. Data validation narratives will also be reviewed and any conclusions about the representativeness of the data set will be discussed.

Comparability – Study results will be used in conjunction with existing data to make qualitative and quantitative assessments of the data to be used to produce the Site reports.

Reconciliation – The DQIs presented in Worksheet #12 will be examined to determine if the MPC were met. This examination will include a combined overall assessment of the results of each analysis pertinent to an objective. Each analysis will first be evaluated separately in terms of major impacts observed from data validation, data quality indicators and measurement performance criteria assessments. Based on the results of these assessments, the quality of the data will be determined. Based on the quality determined, the usability of the data for each analysis will be determined. Based on the combined usability of the data from all analyses for an objective, it will be determined if the DQIs were met and whether project goals were achieved. As part of the reconciliation of each objective, conclusions will be drawn and any limitations on the usability of any of the data will be described.

Completeness - The Environmental Quality Information Systems (EQIIS) database will be queried to summarize the number of samples in each analytical fraction that are estimated and rejected. This data will be used along with the planned samples indicated in the QAPP to calculate the completeness of the obtained data set.

Data validation reports will be reviewed to determine the quality of the data and potential impacts on data usability. Field duplicates will be evaluated against the MPCs outlined in worksheet #12. Non-compliant data will be discussed in the usability report. The following equations will be used:

1. To calculate field duplicate precision: $RPD = 100 \times 2 |X1 - X2| / (X1 + X2)$ where X1 and X2 are the reported concentrations for each duplicate or replicate
2. To calculate completeness: $\% \text{ Completeness} = V/n \times 100$

where V= number of measurements judged valid; n = total number of measurements made and $\% \text{ Completeness} = C/x \times 100$

where C= number of samples collected; x = total number of measurements planned

2. *Describe the evaluative procedures used to assess overall measurement error associated with the project:* PWGC will determine if quality control data is within specifications (MPC) through the data assessment and data validation process.
3. *Identify the personnel responsible for performing the usability assessment:* Richard Kampf or designee

4. Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies: A usability report will describe the rationale for the data used and present any data limitations. The report will include a discussion of the accuracy, precision, representativeness, completeness and comparability of the data set and deviations from planned procedures and analysis and the impact on the project objectives. Tables will be prepared, including: a summary of planned samples, collected samples and parameters analyzed; detections in field and trip blanks; comparison of field duplicates; and a comparison of planned and actual detection limits.

5. Discuss the impacts of any qualified data, any deviations from original plan or sampling procedures, whether the project objectives were met, etc.

The following procedures will be followed for using data in preparing the RACR.

- Defining the nature and extent of contamination – [PWGC will evaluate individual sample results for the RACR. The sample results will be compared to the site specific screening criteria defined as project action limits on worksheet #15. In addition, as part of the RACR, figures will be generated in order to further refine the understanding of the nature and extent of contamination and to help identify data gaps. Figures will include geological profiles and cross-sections, water table maps, contaminant iso-concentration maps, and longitudinal and cross-sectional profiles of groundwater contamination.
- Identifying data gaps - Data gaps will be identified while writing the SI Report. As soon as data gaps are identified, PWGC will discuss them with USEPA/NYSDEC. To identify data gaps, PWGC will evaluate the analytical results by media and determine if results indicate levels or locations of contamination that need to be further delineated.
 - Using qualified data - PWGC utilizes all data not rejected during validation to determine the nature and extent of contamination.
- Deciding if high results are legitimate or outliers - PWGC will assume that all data not rejected during validation will be considered in defining the nature and extent of contamination at the site. PWGC will work with USEPA/NYSDEC if there is a concern about the statistical validity of the sample results. In particular, high “outlier” results that have no surrounding comparable results as confirmation will be discussed with USEPA/NYSDEC.

ATTACHMENT A



GENERAL FIELD SAMPLING GUIDELINES

SOP#: 2001
DATE: 08/11/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to provide general field sampling guidelines that will assist REAC personnel in choosing sampling strategies, location, and frequency for proper assessment of site characteristics. This SOP is applicable to all field activities that involve sampling.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent on site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. EPA endorsement or recommendation for use.

2.0 METHOD SUMMARY

Sampling is the selection of a representative portion of a larger population, universe, or body. Through examination of a sample, the characteristics of the larger body from which the sample was drawn can be inferred. In this manner, sampling can be a valuable tool for determining the presence, type, and extent of contamination by hazardous substances in the environment.

The primary objective of all sampling activities is to characterize a hazardous waste site accurately so that its impact on human health and the environment can be properly evaluated. It is only through sampling and analysis that site hazards can be measured and the job of cleanup and restoration can be accomplished effectively with minimal risk. The sampling itself must be conducted so that every sample collected retains its original physical form and chemical composition. In this way, sample integrity is insured, quality assurance standards are maintained, and the sample can accurately represent the larger body of

material under investigation.

The extent to which valid inferences can be drawn from a sample depends on the degree to which the sampling effort conforms to the project's objectives. For example, as few as one sample may produce adequate, technically valid data to address the project's objectives. Meeting the project's objectives requires thorough planning of sampling activities, and implementation of the most appropriate sampling and analytical procedures. These issues will be discussed in this procedure.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

The amount of sample to be collected, and the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent on the matrix being sampled and the parameter(s) of interest. Sample preservation, containers, handling, and storage for air and waste samples are discussed in the specific SOPs for air and waste sampling techniques.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

The nature of the object or materials being sampled may be a potential problem to the sampler. If a material is homogeneous, it will generally have a uniform composition throughout. In this case, any sample increment can be considered representative of the material. On the other hand, heterogeneous samples present problems to the sampler because of changes in the material over distance, both laterally and vertically.

Samples of hazardous materials may pose a safety threat to both field and laboratory personnel. Proper health and safety precautions should be implemented when handling this type of sample.

Environmental conditions, weather conditions, or non-target chemicals may cause problems and/or interferences when performing sampling activities or when sampling for a specific parameter. Refer to the specific SOPs for sampling techniques.

5.0 EQUIPMENT/APPARATUS

The equipment/apparatus required to collect samples must be determined on a site specific basis. Due to the wide variety of sampling equipment available, refer to the specific SOPs for sampling techniques which include lists of the equipment/apparatus required for sampling.

6.0 REAGENTS

Reagents may be utilized for preservation of samples and for decontamination of sampling equipment. The preservatives required are specified by the analysis to be performed. Decontamination solutions are specified in ERT SOP #2006, Sampling Equipment Decontamination.

7.0 PROCEDURE

7.1 Types of Samples

In relation to the media to be sampled, two basic types of samples can be considered: the environmental sample and the hazardous sample.

Environmental samples are those collected from streams, ponds, lakes, wells, and are off-site samples that are not expected to be contaminated with hazardous materials. They usually do not require the special handling procedures typically used for concentrated wastes. However, in certain instances, environmental samples can contain elevated concentrations of pollutants and in such cases would have to be handled as hazardous samples.

Hazardous or concentrated samples are those collected from drums, tanks, lagoons, pits, waste piles, fresh spills, or areas previously identified as contaminated, and require special handling procedures because of their potential toxicity or hazard. These samples can be further subdivided based on their degree of hazard; however, care should be taken when handling and shipping any wastes believed to be concentrated regardless of the degree.

The importance of making the distinction between environmental and hazardous samples is two-fold:

- (1) Personnel safety requirements: Any sample thought to contain enough hazardous materials to pose a safety threat should be designated as hazardous and handled in a manner which ensures the safety of both field and laboratory personnel.
- (2) Transportation requirements: Hazardous samples must be packaged, labeled, and shipped according to the International Air Transport Association (IATA) Dangerous Goods Regulations or Department of Transportation (DOT) regulations and U.S. EPA guidelines.

7.2 Sample Collection Techniques

In general, two basic types of sample collection techniques are recognized, both of which can be used for either environmental or hazardous samples.

Grab Samples

A grab sample is defined as a discrete aliquot representative of a specific location at a given point in time. The sample is collected all at once at one particular point in the sample medium. The representativeness of such samples is defined by the nature of the materials being sampled. In general, as sources vary over time and distance, the representativeness of grab samples will decrease.

Composite Samples

Composites are nondiscrete samples composed of more than one specific aliquot collected at various sampling locations and/or different points in time. Analysis of this type of sample produces an average value and can in certain instances be used as an alternative to analyzing a number of individual grab samples and calculating an average value. It should be noted, however, that compositing can mask problems by diluting isolated concentrations of some hazardous compounds below detection limits.

Compositing is often used for environmental samples and may be used for hazardous samples under certain conditions. For example, compositing of hazardous waste is often performed after compatibility tests have

been completed to determine an average value over a number of different locations (group of drums). This procedure generates data that can be useful by providing an average concentration within a number of units, can serve to keep analytical costs down, and can provide information useful to transporters and waste disposal operations.

For sampling situations involving hazardous wastes, grab sampling techniques are generally preferred because grab sampling minimizes the amount of time sampling personnel must be in contact with the wastes, reduces risks associated with compositing unknowns, and eliminates chemical changes that might occur due to compositing.

7.3 Types of Sampling Strategies

The number of samples that should be collected and analyzed depends on the objective of the investigation. There are three basic sampling strategies: random, systematic, and judgmental sampling.

Random sampling involves collection of samples in a nonsystematic fashion from the entire site or a specific portion of a site. Systematic sampling involves collection of samples based on a grid or a pattern which has been previously established. When judgmental sampling is performed, samples are collected only from the portion(s) of the site most likely to be contaminated. Often, a combination of these strategies is the best approach depending on the type of the suspected/known contamination, the uniformity and size of the site, the level/type of information desired, etc.

7.4 QA Work Plans (QAWP)

A QAWP is required when it becomes evident that a field investigation is necessary. It should be initiated in conjunction with, or immediately following, notification of the field investigation. This plan should be clear and concise and should detail the following basic components, with regard to sampling activities:

- C Objective and purpose of the investigation.
- C Basis upon which data will be evaluated.
- C Information known about the site including location, type and size of the facility, and length of operations/abandonment.
- C Type and volume of contaminated material, contaminants of concern (including

concentration), and basis of the information/data.

- C Technical approach including media/matrix to be sampled, sampling equipment to be used, sample equipment decontamination (if necessary), sampling design and rationale, and SOPs or description of the procedure to be implemented.
- C Project management and reporting, schedule, project organization and responsibilities, manpower and cost projections, and required deliverables.
- C QA objectives and protocols including tables summarizing field sampling and QA/QC analysis and objectives.

Note that this list of QAWP components is not all-inclusive and that additional elements may be added or altered depending on the specific requirements of the field investigation. It should also be recognized that although a detailed QAWP is quite important, it may be impractical in some instances. Emergency responses and accidental spills are prime examples of such instances where time might prohibit the development of site-specific QAWPs prior to field activities. In such cases, investigators would have to rely on general guidelines and personal judgment, and the sampling or response plans might simply be a strategy based on preliminary information and finalized on site. In any event, a plan of action should be developed, no matter how concise or informal, to aid investigators in maintaining a logical and consistent order to the implementation of their task.

7.5 Legal Implications

The data derived from sampling activities are often introduced as critical evidence during litigation of a hazardous waste site cleanup. Legal issues in which sampling data are important may include cleanup cost recovery, identification of pollution sources and responsible parties, and technical validation of remedial design methodologies. Because of the potential for involvement in legal actions, strict adherence to technical and administrative SOPs is essential during both the development and implementation of sampling activities.

Technically valid sampling begins with thorough planning and continues through the sample collection and analytical procedures. Administrative requirements involve thorough, accurate

documentation of all sampling activities. Documentation requirements include maintenance of a chain of custody, as well as accurate records of field activities and analytical instructions. Failure to observe these procedures fully and consistently may result in data that are questionable, invalid and non-defensible in court, and the consequent loss of enforcement proceedings.

8.0 CALCULATIONS

Refer to the specific SOPs for any calculations which are associated with sampling techniques.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

Refer to the specific SOPs for the type and frequency of QA/QC samples to be analyzed, the acceptance criteria for the QA/QC samples, and any other QA/QC activities which are associated with sampling techniques.

10.0 DATA VALIDATION

Refer to the specific SOPs for data validation activities that are associated with sampling techniques.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA, and corporate health and safety procedures.



SAMPLING EQUIPMENT DECONTAMINATION

SOP#: 2006
DATE: 08/11/94
REV. #: 0.0

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to provide a description of the methods used for preventing, minimizing, or limiting cross-contamination of samples due to inappropriate or inadequate equipment decontamination and to provide general guidelines for developing decontamination procedures for sampling equipment to be used during hazardous waste operations as per 29 Code of Federal Regulations (CFR) 1910.120. This SOP does not address personnel decontamination.

These are standard (i.e. typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitation, or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute U.S. Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Removing or neutralizing contaminants from equipment minimizes the likelihood of sample cross contamination, reduces or eliminates transfer of contaminants to clean areas, and prevents the mixing of incompatible substances.

Gross contamination can be removed by physical decontamination procedures. These abrasive and non-abrasive methods include the use of brushes, air and wet blasting, and high and low pressure water cleaning.

The first step, a soap and water wash, removes all visible particulate matter and residual oils and grease. This may be preceded by a steam or high pressure

water wash to facilitate residuals removal. The second step involves a tap water rinse and a distilled/deionized water rinse to remove the detergent. An acid rinse provides a low pH media for trace metals removal and is included in the decontamination process if metal samples are to be collected. It is followed by another distilled/deionized water rinse. If sample analysis does not include metals, the acid rinse step can be omitted. Next, a high purity solvent rinse is performed for trace organics removal if organics are a concern at the site. Typical solvents used for removal of organic contaminants include acetone, hexane, or water. Acetone is typically chosen because it is an excellent solvent, miscible in water, and not a target analyte on the Priority Pollutant List. If acetone is known to be a contaminant of concern at a given site or if Target Compound List analysis (which includes acetone) is to be performed, another solvent may be substituted. The solvent must be allowed to evaporate completely and then a final distilled/deionized water rinse is performed. This rinse removes any residual traces of the solvent.

The decontamination procedure described above may be summarized as follows:

1. Physical removal
2. Non-phosphate detergent wash
3. Tap water rinse
4. Distilled/deionized water rinse
5. 10% nitric acid rinse
6. Distilled/deionized water rinse
7. Solvent rinse (pesticide grade)
8. Air dry
9. Distilled/deionized water rinse

If a particular contaminant fraction is not present at the site, the nine (9) step decontamination procedure specified above may be modified for site specificity. For example, the nitric acid rinse may be eliminated if metals are not of concern at a site. Similarly, the solvent rinse may be eliminated if organics are not of

concern at a site. Modifications to the standard procedure should be documented in the site specific work plan or subsequent report.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

The amount of sample to be collected and the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent on the matrix being sampled and the parameter(s) of interest.

More specifically, sample collection and analysis of decontamination waste may be required before beginning proper disposal of decontamination liquids and solids generated at a site. This should be determined prior to initiation of site activities.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

- C The use of distilled/deionized water commonly available from commercial vendors may be acceptable for decontamination of sampling equipment provided that it has been verified by laboratory analysis to be analyte free (specifically for the contaminants of concern).
- C The use of an untreated potable water supply is not an acceptable substitute for tap water. Tap water may be used from any municipal or industrial water treatment system.
- C If acids or solvents are utilized in decontamination they raise health and safety, and waste disposal concerns.
- C Damage can be incurred by acid and solvent washing of complex and sophisticated sampling equipment.

5.0 EQUIPMENT/APPARATUS

Decontamination equipment, materials, and supplies are generally selected based on availability. Other considerations include the ease of decontaminating or disposing of the equipment. Most equipment and supplies can be easily procured. For example, soft-

bristle scrub brushes or long-handled bottle brushes can be used to remove contaminants. Large galvanized wash tubs, stock tanks, or buckets can hold wash and rinse solutions. Children's wading pools can also be used. Large plastic garbage cans or other similar containers lined with plastic bags can help segregate contaminated equipment. Contaminated liquid can be stored temporarily in metal or plastic cans or drums.

The following standard materials and equipment are recommended for decontamination activities:

5.1 Decontamination Solutions

- C Non-phosphate detergent
- C Selected solvents (acetone, hexane, nitric acid, etc.)
- C Tap water
- C Distilled or deionized water

5.2 Decontamination Tools/Supplies

- C Long and short handled brushes
- C Bottle brushes
- C Drop cloth/plastic sheeting
- C Paper towels
- C Plastic or galvanized tubs or buckets
- C Pressurized sprayers (H₂O)
- C Solvent sprayers
- C Aluminum foil

5.3 Health and Safety Equipment

Appropriate personal protective equipment (i.e., safety glasses or splash shield, appropriate gloves, aprons or coveralls, respirator, emergency eye wash)

5.4 Waste Disposal

- C Trash bags
- C Trash containers
- C 55-gallon drums
- C Metal/plastic buckets/containers for storage and disposal of decontamination solutions

6.0 REAGENTS

There are no reagents used in this procedure aside from the actual decontamination solutions. Table 1 (Appendix A) lists solvent rinses which may be required for elimination of particular chemicals. In

general, the following solvents are typically utilized for decontamination purposes:

- C 10% nitric acid is typically used for inorganic compounds such as metals. An acid rinse may not be required if inorganics are not a contaminant of concern.
- C Acetone (pesticide grade)⁽¹⁾
- C Hexane (pesticide grade)⁽¹⁾
- C Methanol⁽¹⁾

⁽¹⁾ - Only if sample is to be analyzed for organics.

7.0 PROCEDURES

As part of the health and safety plan, a decontamination plan should be developed and reviewed. The decontamination line should be set up before any personnel or equipment enter the areas of potential exposure. The equipment decontamination plan should include:

- C The number, location, and layout of decontamination stations.
- C Decontamination equipment needed.
- C Appropriate decontamination methods.
- C Methods for disposal of contaminated clothing, equipment, and solutions.
- C Procedures can be established to minimize the potential for contamination. This may include: (1) work practices that minimize contact with potential contaminants; (2) using remote sampling techniques; (3) covering monitoring and sampling equipment with plastic, aluminum foil, or other protective material; (4) watering down dusty areas; (5) avoiding laying down equipment in areas of obvious contamination; and (6) use of disposable sampling equipment.

7.1 Decontamination Methods

All samples and equipment leaving the contaminated area of a site must be decontaminated to remove any contamination that may have adhered to equipment. Various decontamination methods will remove contaminants by: (1) flushing or other physical action, or (2) chemical complexing to inactivate

contaminants by neutralization, chemical reaction, disinfection, or sterilization.

Physical decontamination techniques can be grouped into two categories: abrasive methods and non-abrasive methods, as follows:

7.1.1 Abrasive Cleaning Methods

Abrasive cleaning methods work by rubbing and wearing away the top layer of the surface containing the contaminant. The mechanical abrasive cleaning methods are most commonly used at hazardous waste sites. The following abrasive methods are available:

Mechanical

Mechanical methods of decontamination include using metal or nylon brushes. The amount and type of contaminants removed will vary with the hardness of bristles, length of time brushed, degree of brush contact, degree of contamination, nature of the surface being cleaned, and degree of contaminant adherence to the surface.

Air Blasting

Air blasting equipment uses compressed air to force abrasive material through a nozzle at high velocities. The distance between nozzle and surface cleaned, air pressure, time of application, and angle at which the abrasive strikes the surface will dictate cleaning efficiency. Disadvantages of this method are the inability to control the amount of material removed and the large amount of waste generated.

Wet Blasting

Wet blast cleaning involves use of a suspended fine abrasive. The abrasive/water mixture is delivered by compressed air to the contaminated area. By using a very fine abrasive, the amount of materials removed can be carefully controlled.

7.1.2 Non-Abrasive Cleaning Methods

Non-abrasive cleaning methods work by forcing the contaminant off a surface with pressure. In general, the equipment surface is not removed using non-abrasive methods.

Low-Pressure Water

This method consists of a container which is filled with water. The user pumps air out of the container to create a vacuum. A slender nozzle and hose allow the user to spray in hard-to-reach places.

High-Pressure Water

This method consists of a high-pressure pump, an operator controlled directional nozzle, and a high-pressure hose. Operating pressure usually ranges from 340 to 680 atmospheres (atm) and flow rates usually range from 20 to 140 liters per minute.

Ultra-High-Pressure Water

This system produces a water jet that is pressured from 1,000 to 4,000 atmospheres. This ultra-high-pressure spray can remove tightly-adhered surface films. The water velocity ranges from 500 meters/second (m/s) (1,000 atm) to 900 m/s (4,000 atm). Additives can be used to enhance the cleaning action.

Rinsing

Contaminants are removed by rinsing through dilution, physical attraction, and solubilization.

Damp Cloth Removal

In some instances, due to sensitive, non-waterproof equipment or due to the unlikelihood of equipment being contaminated, it is not necessary to conduct an extensive decontamination procedure. For example, air sampling pumps hooked on a fence, placed on a drum, or wrapped in plastic bags are not likely to become heavily contaminated. A damp cloth should be used to wipe off contaminants which may have adhered to equipment through airborne contaminants or from surfaces upon which the equipment was set.

Disinfection/Sterilization

Disinfectants are a practical means of inactivating infectious agents. Unfortunately, standard sterilization methods are impractical for large equipment. This method of decontamination is typically performed off-site.

7.2 Field Sampling Equipment Decontamination Procedures

The decontamination line is setup so that the first station is used to clean the most contaminated item. It progresses to the last station where the least contaminated item is cleaned. The spread of contaminants is further reduced by separating each decontamination station by a minimum of three (3) feet. Ideally, the contamination should decrease as the equipment progresses from one station to another farther along in the line.

A site is typically divided up into the following boundaries: Hot Zone or Exclusion Zone (EZ), the Contamination Reduction Zone (CRZ), and the Support or Safe Zone (SZ). The decontamination line should be setup in the Contamination Reduction Corridor (CRC) which is in the CRZ. Figure 1 (Appendix B) shows a typical contaminant reduction zone layout. The CRC controls access into and out of the exclusion zone and confines decontamination activities to a limited area. The CRC boundaries should be conspicuously marked. The far end is the hotline, the boundary between the exclusion zone and the contamination reduction zone. The size of the decontamination corridor depends on the number of stations in the decontamination process, overall dimensions of the work zones, and amount of space available at the site. Whenever possible, it should be a straight line.

Anyone in the CRC should be wearing the level of protection designated for the decontamination crew. Another corridor may be required for the entry and exit of heavy equipment. Sampling and monitoring equipment and sampling supplies are all maintained outside of the CRC. Personnel don their equipment away from the CRC and enter the exclusion zone through a separate access control point at the hotline. One person (or more) dedicated to decontaminating equipment is recommended.

7.2.1 Decontamination Setup

Starting with the most contaminated station, the decontamination setup should be as follows:

Station 1: Segregate Equipment Drop

Place plastic sheeting on the ground (Figure 2, Appendix B). Size will depend on amount of

equipment to be decontaminated. Provide containers lined with plastic if equipment is to be segregated. Segregation may be required if sensitive equipment or mildly contaminated equipment is used at the same time as equipment which is likely to be heavily contaminated.

Station 2: Physical Removal With A High-Pressure Washer (Optional)

As indicated in 7.1.2, a high-pressure wash may be required for compounds which are difficult to remove by washing with brushes. The elevated temperature of the water from the high-pressure washers is excellent at removing greasy/oily compounds. High pressure washers require water and electricity.

A decontamination pad may be required for the high-pressure wash area. An example of a wash pad may consist of an approximately 1 1/2 foot-deep basin lined with plastic sheeting and sloped to a sump at one corner. A layer of sand can be placed over the plastic and the basin is filled with gravel or shell. The sump is also lined with visqueen and a barrel is placed in the hole to prevent collapse. A sump pump is used to remove the water from the sump for transfer into a drum.

Typically heavy machinery is decontaminated at the end of the day unless site sampling requires that the machinery be decontaminated frequently. A separate decontamination pad may be required for heavy equipment.

Station 3: Physical Removal With Brushes And A Wash Basin

Prior to setting up Station 3, place plastic sheeting on the ground to cover areas under Station 3 through Station 10.

Fill a wash basin, a large bucket, or child's swimming pool with non-phosphate detergent and tap water. Several bottle and bristle brushes to physically remove contamination should be dedicated to this station. Approximately 10 - 50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 4: Water Basin

Fill a wash basin, a large bucket, or child's swimming

pool with tap water. Several bottle and bristle brushes should be dedicated to this station. Approximately 10-50 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 5: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to contain the water during the rinsing process. Approximately 10-20 gallons of water may be required initially depending upon the amount of equipment to decontaminate and the amount of gross contamination.

Station 6: Nitric Acid Sprayers

Fill a spray bottle with 10% nitric acid. An acid rinse may not be required if inorganics are not a contaminant of concern. The amount of acid will depend on the amount of equipment to be decontaminated. Provide a 5-gallon bucket or basin to collect acid during the rinsing process.

Station 7: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

Station 8: Organic Solvent Sprayers

Fill a spray bottle with an organic solvent. After each solvent rinse, the equipment should be rinsed with distilled/deionized water and air dried. Amount of solvent will depend on the amount of equipment to decontaminate. Provide a 5-gallon bucket or basin to collect the solvent during the rinsing process.

Solvent rinses may not be required unless organics are a contaminant of concern, and may be eliminated from the station sequence.

Station 9: Low-Pressure Sprayers

Fill a low-pressure sprayer with distilled/deionized water. Provide a 5-gallon bucket or basin to collect water during the rinsate process.

Station 10: Clean Equipment Drop

Lay a clean piece of plastic sheeting over the bottom

plastic layer. This will allow easy removal of the plastic in the event that it becomes dirty. Provide aluminum foil, plastic, or other protective material to wrap clean equipment.

7.2.2 Decontamination Procedures

Station 1: Segregate Equipment Drop

Deposit equipment used on-site (i.e., tools, sampling devices and containers, monitoring instruments radios, clipboards, etc.) on the plastic drop cloth/sheet or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross contamination. Loose leaf sampling data sheets or maps can be placed in plastic zip lock bags if contamination is evident.

Station 2: Physical Removal With A High-Pressure Washer (Optional)

Use high pressure wash on grossly contaminated equipment. Do not use high- pressure wash on sensitive or non-waterproof equipment.

Station 3: Physical Removal With Brushes And A Wash Basin

Scrub equipment with soap and water using bottle and bristle brushes. Only sensitive equipment (i.e., radios, air monitoring and sampling equipment) which is waterproof should be washed. Equipment which is not waterproof should have plastic bags removed and wiped down with a damp cloth. Acids and organic rinses may also ruin sensitive equipment. Consult the manufacturers for recommended decontamination solutions.

Station 4: Equipment Rinse

Wash soap off of equipment with water by immersing the equipment in the water while brushing. Repeat as many times as necessary.

Station 5: Low-Pressure Rinse

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

Station 6: Nitric Acid Sprayers (required only if metals are a contaminant of concern)

Using a spray bottle rinse sampling equipment with nitric acid. Begin spraying (inside and outside) at one end of the equipment allowing the acid to drip to the other end into a 5-gallon bucket. A rinsate blank may be required at this station. Refer to Section 9.

Station 7: Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure sprayer.

Station 8: Organic Solvent Sprayers

Rinse sampling equipment with a solvent. Begin spraying (inside and outside) at one end of the equipment allowing the solvent to drip to the other end into a 5-gallon bucket. Allow the solvent to evaporate from the equipment before going to the next station. A QC rinsate sample may be required at this station.

Station 9: Low-Pressure Sprayers

Rinse sampling equipment with distilled/deionized water with a low-pressure washer.

Station 10: Clean Equipment Drop

Lay clean equipment on plastic sheeting. Once air dried, wrap sampling equipment with aluminum foil, plastic, or other protective material.

7.2.3 Post Decontamination Procedures

1. Collect high-pressure pad and heavy equipment decontamination area liquid and waste and store in appropriate drum or container. A sump pump can aid in the collection process. Refer to the Department of Transportation (DOT) requirements for appropriate containers based on the contaminant of concern.
2. Collect high-pressure pad and heavy equipment decontamination area solid waste and store in appropriate drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.
3. Empty soap and water liquid wastes from basins and buckets and store in appropriate

drum or container. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.

4. Empty acid rinse waste and place in appropriate container or neutralize with a base and place in appropriate drum. pH paper or an equivalent pH test is required for neutralization. Consult DOT requirements for appropriate drum for acid rinse waste.
5. Empty solvent rinse sprayer and solvent waste into an appropriate container. Consult DOT requirements for appropriate drum for solvent rinse waste.
6. Using low-pressure sprayers, rinse basins, and brushes. Place liquid generated from this process into the wash water rinse container.
7. Empty low-pressure sprayer water onto the ground.
8. Place all solid waste materials generated from the decontamination area (i.e., gloves and plastic sheeting, etc.) in an approved DOT drum. Refer to the DOT requirements for appropriate containers based on the contaminant of concern.
9. Write appropriate labels for waste and make arrangements for disposal. Consult DOT regulations for the appropriate label for each drum generated from the decontamination process.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

A rinsate blank is one specific type of quality control sample associated with the field decontamination process. This sample will provide information on the effectiveness of the decontamination process employed in the field.

Rinsate blanks are samples obtained by running analyte free water over decontaminated sampling

equipment to test for residual contamination. The blank water is collected in sample containers for handling, shipment, and analysis. These samples are treated identical to samples collected that day. A rinsate blank is used to assess cross contamination brought about by improper decontamination procedures. Where dedicated sampling equipment is not utilized, collect one rinsate blank per day per type of sampling device samples to meet QA2 and QA3 objectives.

If sampling equipment requires the use of plastic tubing it should be disposed of as contaminated and replaced with clean tubing before additional sampling occurs.

10.0 DATA VALIDATION

Results of quality control samples will be evaluated for contamination. This information will be utilized to qualify the environmental sample results in accordance with the project's data quality objectives.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow OSHA, U.S. EPA, corporate, and other applicable health and safety procedures.

Decontamination can pose hazards under certain circumstances. Hazardous substances may be incompatible with decontamination materials. For example, the decontamination solution may react with contaminants to produce heat, explosion, or toxic products. Also, vapors from decontamination solutions may pose a direct health hazard to workers by inhalation, contact, fire, or explosion.

The decontamination solutions must be determined to be acceptable before use. Decontamination materials may degrade protective clothing or equipment; some solvents can permeate protective clothing. If decontamination materials do pose a health hazard, measures should be taken to protect personnel or substitutions should be made to eliminate the hazard. The choice of respiratory protection based on contaminants of concern from the site may not be appropriate for solvents used in the decontamination process.

Safety considerations should be addressed when using abrasive and non-abrasive decontamination

equipment. Maximum air pressure produced by abrasive equipment could cause physical injury. Displaced material requires control mechanisms.

Material generated from decontamination activities requires proper handling, storage, and disposal. Personal Protective Equipment may be required for these activities.

Material safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard (i.e., acetone, alcohol, and trisodiumphosphate).

In some jurisdictions, phosphate containing detergents (i.e., TSP) are banned.

12.0 REFERENCES

Field Sampling Procedures Manual, New Jersey Department of Environmental Protection, February, 1988.

A Compendium of Superfund Field Operations Methods, EPA 540/p-87/001.

Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, USEPA Region IV, April 1, 1986.

Guidelines for the Selection of Chemical Protective Clothing, Volume 1, Third Edition, American Conference of Governmental Industrial Hygienists, Inc., February, 1987.

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA, October, 1985.

APPENDIX A

Table

Table 1. Soluble Contaminants and Recommended Solvent Rinse

TABLE 1 Soluble Contaminants and Recommended Solvent Rinse		
SOLVENT ⁽¹⁾	EXAMPLES OF SOLVENTS	SOLUBLE CONTAMINANTS
Water	Deionized water Tap water	Low-chain hydrocarbons Inorganic compounds Salts Some organic acids and other polar compounds
Dilute Acids	Nitric acid Acetic acid Boric acid	Basic (caustic) compounds (e.g., amines and hydrazines)
Dilute Bases	Sodium bicarbonate (e.g., soap detergent)	Acidic compounds Phenol Thiols Some nitro and sulfonic compounds
Organic Solvents ⁽²⁾	Alcohols Ethers Ketones Aromatics Straight chain alkalines (e.g., hexane) Common petroleum products (e.g., fuel, oil, kerosene)	Nonpolar compounds (e.g., some organic compounds)
Organic Solvent ⁽²⁾	Hexane	PCBs

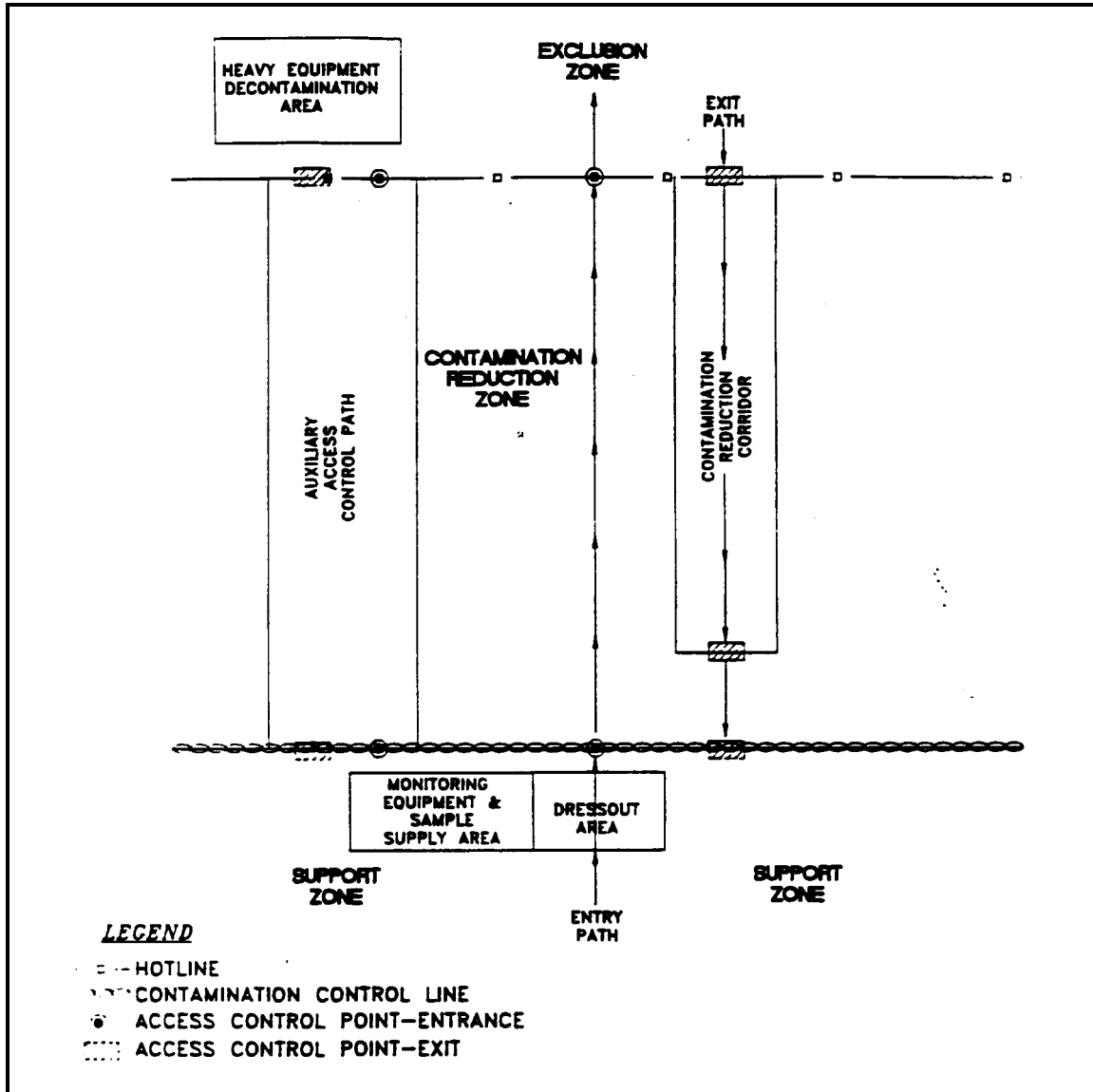
⁽¹⁾ - Material safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard

⁽²⁾ - WARNING: Some organic solvents can permeate and/or degrade the protective clothing

APPENDIX B

Figures

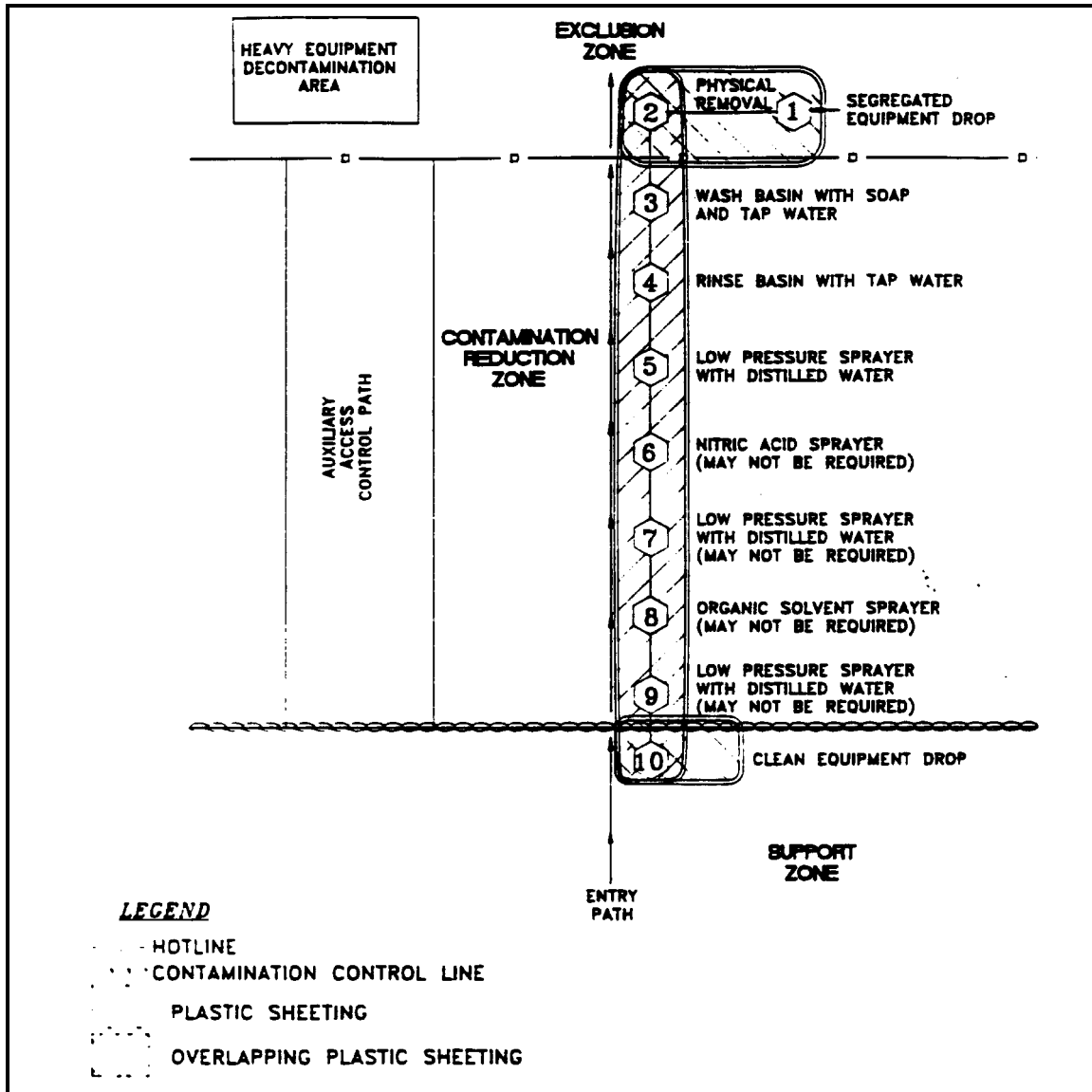
Figure 1. Contamination Reduction Zone Layout



APPENDIX B (Cont'd.)

Figures

Figure 2. Decontamination Layout



APPENDIX C
COMMUNITY AIR MONITORING PLAN

P.W. GROSSER CONSULTING, INC.
PROJECT No. RGI1504

COMMUNITY AIR MONITORING PLAN

GARVIES POINT WATERFRONT REVITALIZATION PROJECT
GELN COVE, NEW YORK

SUBMITTED:
March 2016

PREPARED FOR:
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A, Section C
625 Broadway
Albany, New York 12233

United States Environmental Protection Agency
Region 2
290 Broadway, 20th Floor
New York, New York 10007

ON BEHALF OF:
RXR-Glen Isle Partners, LLC
625 RXR Plaza
Uniondale, New York 11556

PREPARED BY:
P.W. Grosser Consulting, Inc.

630 Johnson Avenue, Suite 7
Bohemia, New York 11716

TABLE OF CONTENTS		PAGE
1.0	INTRODUCTION	1
1.1	Regulatory Requirements	1
2.0	AIR MONITORING	2
2.1	Real-Time Monitoring	2
2.1.1	Work Area	2
2.1.2	Community Air Monitoring Requirements	2
3.0	VAPOR EMISSION RESPONSE PLAN	4
4.0	MAJOR VAPOR EMISSION RESPONSE PLAN	5
5.0	VAPOR SUPPRESSION TECHNIQUES	6
6.0	DUST SUPPRESSION TECHNIQUES	7
7.0	DATA QUALITY ASSURANCE	8
7.1	Calibration	8
7.2	Operations	8
7.3	Data Review	8
8.0	RECORDS AND REPORTING	9

1.0 INTRODUCTION

This Community Air Monitoring Plan (CAMP) provides measures for protection for on-site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved) from potential airborne contaminant releases resulting from remedial action at the Captain's Cove Site, Glen Cove, New York.

The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that the remedial work did not spread contamination off-site through the air.

The primary concerns for this site are VOCs, SVOCs, metals and dust particulates.

1.1 Regulatory Requirements

This CAMP was established in accordance with the following requirements:

- 29 CFR 1910.120(h): This regulation specifies that air shall be monitored to identify and quantify levels of airborne hazardous substances and health hazards, and to determine the appropriate level of protection for workers.
- New York State Department of Health's (NYSDOH) Generic Community Air Monitoring Plan: This guidance specifies that a community air-monitoring program shall be implemented to protect the surrounding community and to confirm that the work does not spread contamination off-site through the air.
- New York State Department of Environmental Conservation (NYSDEC) Technical and Guidance Memorandum (TAGM) #4031 - Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites: This guidance provides a basis for developing and implementing a fugitive dust suppression and particulate monitoring program as an element of a hazardous waste site's health and safety program.

2.0 AIR MONITORING

The following sections contain information describing the types, frequency and location of real-time monitoring.

2.1 Real-Time Monitoring

This section addresses the real-time monitoring that will be conducted within the work area, and along the site perimeter, during intrusive activities such as excavation, manipulation of soil piles, soil sampling, etc.

2.1.1 *Work Area*

The following instruments will be used for work area monitoring:

- Photoionization Detector (PID)
- Dust Monitor

Table 1-1 presents a breakdown of each main activity and provides the instrumentation, frequency and location of the real-time monitoring for the site. Table 1-2 lists the Real-Time Air Monitoring Action Levels to be used in all work areas.

2.1.2 *Community Air Monitoring Requirements*

To establish ambient air background concentrations, air will be monitored at several locations around the site perimeter before excavation activities begin. These points will be monitored periodically in series during the site work.

Fugitive respirable dust will be monitored using a Thermo Electron Corporation Model pDR-1000AN/1200 aerosol monitor or equivalent. Air will be monitored for VOCs with a portable Photovac MicroTip photoionization detector (PID), or equivalent. Table 1-1 presents a breakdown of each main activity and provides the instrumentation, frequency and location of the real-time monitoring for the site. Table 1-2 lists the Real-Time Air Monitoring Action Levels to be used in all work areas. All air monitoring data is documented in a site log book by the designated site safety officer. PWGC's site safety officer or delegate must ensure that air monitoring instruments are calibrated and maintained in accordance with manufacturer's specifications. All instruments will be zeroed daily and checked for accuracy. A daily log will be kept. If additional monitoring is required, the protocols will be developed and appended to this plan.

Table 1-1
Frequency and Location of Air Monitoring

ACTIVITY	AIR MONITORING INSTRUMENT	FREQUENCY AND LOCATION
Sampling & Excavation	PID, Dust Monitor	Continuous in Breathing Zone (BZ) during intrusive activities or if odors become apparent, screening in the BZ every 30 minutes during non-intrusive activities Continuous at the perimeter (upwind & downwind) during intrusive activities

Table 1-2
Real-Time Air Monitoring Action Levels

AIR MONITORING INSTRUMENT	MONITORING LOCATION	ACTION LEVEL	SITE ACTION	REASON
PID	Breathing Zone	0-25 ppm, non-transient	None	Exposure below established exposure limits
PID	Breathing Zone	25-100 ppm, non-transient	Don APR	Based on potential exposure to VOCs
PID	Breathing Zone	>100 ppm, non-transient	Don ASR or SCBA, Institute vapor/odor suppression measures, Notify HSM.	Increased exposure to site contaminants, potential for vapor release to public areas.
PID	Work Area Perimeter	< 5 ppm	None	Exposure below established exposure limits.
PID	Work Area Perimeter	> 5 ppm	Stop work and implement vapor release response plan until readings return to acceptable levels, Notify HSM.	Increased exposure to site contaminants, potential for vapor release to public areas
Aerosol Monitor	Work Area Perimeter	>100 but < 150 $\mu\text{g}/\text{m}^3$ for 15 minutes	Institute dust suppression measures, Notify HSM.	Work to continue if particulate concentrations remain below 150 $\mu\text{g}/\text{m}^3$

AIR MONITORING INSTRUMENT	MONITORING LOCATION	ACTION LEVEL	SITE ACTION	REASON
Aerosol Monitor	Work Area Perimeter	>150 µg/m ³	Don ASR or SCBA, Institute dust suppression measures, Notify HSM.	Stop work and implement dust suppression techniques until readings return to acceptable levels, Notify HSM.

3.0 VAPOR EMISSION RESPONSE PLAN

This section is excerpted from the NYSDOH guidance for Community Air Monitoring Plan - Ground Intrusive Activities.

If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the work area, activities will be halted and monitoring continued. Vapor suppression measures can also be taken at this time. If the organic vapor level decreases below 5 ppm above background, work activities can resume. If the organic vapor levels are greater than 5 ppm over background but less than 25 ppm over background at the perimeter of the work area, activities can resume provided:

- the organic vapor level 200 feet downwind of the work area or half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background.

If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shut down. When work shutdown occurs, downwind air monitoring as directed by the Site Health & Safety Officer (SHSO) will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission Response Plan Section.

4.0 MAJOR VAPOR EMISSION RESPONSE PLAN

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work area or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If efforts to abate the emission source (see Section 5.0) are unsuccessful and if organic vapor levels are approaching 5 ppm above background for more than 30 minutes in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be placed into effect.

However, the Major Vapor Emission Response Plan shall be immediately placed in effect if organic vapor levels are greater than 10 ppm above background.

Upon activation, the following activities will be undertaken:

1. All emergency Response Contacts as listed in the Health & Safety Plan will go into effect.
2. The local police authorities will immediately be contacted by the Health & Safety Officer and advised of the situation.
3. Frequent air monitoring will be conducted at 30-minute intervals within the 20 Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Health & Safety Officer.

5.0 VAPOR SUPPRESSION TECHNIQUES

Vapor suppression techniques must be employed when action levels warrant the use of these techniques.

The techniques to be implemented for control of VOCs from stockpiled soil or from the open excavation will include one or more of the following:

- cover with plastic
- cover with “clean soil”
- application of hydro-mulch material*
- limit working hours to favorable wind and temperature conditions

*This material is a seedless version of the hydro-seed product commonly used by commercial landscaping contractors to provide stabilization and rapid grow-in of grasses or wild flowers along highways, embankments and other large areas. Hydro-mulch can be sprayed over open excavation areas, temporary stockpile areas and loaded trucks, as necessary. This is a highly effective method for controlling odors, because the release of odors is sealed immediately at the source.

6.0 DUST SUPPRESSION TECHNIQUES

Reasonable dust-suppression techniques must be employed during all work that may generate dust, such as excavation, grading, and placement of clean fill. The following techniques were shown to be effective for controlling the generation and migration of dust during remedial activities:

- Wetting equipment and excavation faces;
- Spraying water on buckets during excavation and dumping;
- Hauling materials in properly covered containers; and,
- Restricting vehicle speeds to 10 mph.

Using atomizing sprays will prevent overly wet conditions, conserve water, and offer an effective means of suppressing fugitive dust. It is imperative that utilizing water for suppressing dust will not create surface runoff.

7.0 DATA QUALITY ASSURANCE

7.1 Calibration

Instrument calibration shall be documented in the designated field logbook. All instruments shall be calibrated before each shift. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

7.2 Operations

All instruments shall be operated in accordance with the manufacturer's specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment will be maintained on-site by the FOL/HSO for reference.

7.3 Data Review

The Field Team Leader FOL/SHSO will interpret all monitoring data based on Table 1-2 and his/her professional judgment. The FOL/HSO shall review the data with the HSM to evaluate the potential for worker exposure, upgrades/downgrades in level of protection, comparison to direct reading instrumentation and changes in the integrated monitoring strategy.

Monitoring and sampling data, along with all sample documentation will be periodically reviewed by the HSM.

8.0 RECORDS AND REPORTING

All readings must be recorded and available for review by personnel from NYSDEC and USEPA. Should any of the action levels be exceeded, the NYSDEC Division of Air Resources must be notified in writing within five (5) working days.

The notification shall include a description of the control measures implemented to prevent further exceedances.

APPENDIX D RADIATION MONITORING PLAN

P.W. GROSSER CONSULTING, INC.
PROJECT No. RG11504

Radiation Monitoring Plan

GARVIES POINT WATERFRONT REVITALIZATION PROJECT
GELN COVE, NEW YORK

SUBMITTED:
MARCH 2016

PREPARED FOR:
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A, Section C
625 Broadway
Albany, New York 12233

United States Environmental Protection Agency
Region 2
290 Broadway, 20th Floor
New York, New York 10007

ON BEHALF OF:
RXR-Glen Isle Partners, LLC
625 RXR Plaza
Uniondale, New York 11556

PREPARED BY:
P.W. Grosser Consulting, Inc.
630 Johnson Avenue, Suite 7
Bohemia, New York 11716

TABLE OF CONTENTS

	Page
1.0 INTRODUCTION	2
1.1 Purpose and Scope	2
2.0 RADIATION MONITORING PLAN	2
2.1 Health Physics Field Technician Qualifications	3
2.2 Selection of Radiation Monitoring Instrument	3
2.3 Radiation Instrument Calibration and Operation	3
2.4 Site Background	4
2.5 Radiological Walkover Survey/Scan	4
2.5 Radiation Monitoring Methodology	4
2.5.1 Personal Protective Equipment	4
2.5.2 Excavation Screening	4
2.5.3 Screening Criteria	5
2.6 Soil Sampling and Radiological Analysis	6

LIST OF ACRONYMS

cpm	Counts per Minute
EPA	United States Environmental Protection Agency
FS	Feasibility Study
HPFT	Health Physics Field Technician
HPSO	Health Physics Safety Officer
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentrations
m/s	Meters per Second
Nal	Sodium Iodide
NYSDEC	New York State Department of Environmental Conservation
pCi/g	Picocuries per Gram
RMP	Radiation Monitoring Plan
RI	Remedial Investigation
SMP	Site Management Plan

PROJECT: Garvies Point Waterfront Revitalization Project. The project will include a remedial action to excavate and remove contaminants of concern.

This form indicates the review and acceptance of the document listed below by a Certified Health Physicist.

THE FOLLOWING DOCUMENT(S) HAVE BEEN REVIEWED AND ACCEPTED:

- ♦ Radiation Monitoring Plan – Garvies Point Waterfront Revitalization Project

PREPARED FOR:

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau E, 12th Floor
625 Broadway
Albany, New York 12233-7017

PREPARED ON BEHALF OF

RXR-Glen Isle Partners, LLC
625 RXR Plaza
Uniondale, New York 11556

PREPARED BY:

P.W. Grosser Consulting, Inc.
630 Johnson Avenue, Suite 7
Bohemia, New York 11716

REVIEWED & ACCEPTED BY:

Safety and Ecology Corporation
2800 Solway Road
Knoxville, Tennessee 37931



Andrew Lombardo, CHP

3/28/16

Date

1.0 INTRODUCTION

This Radiation Monitoring Plan (RMP) has been prepared in accordance with the Site Management Plan for Captain's Cove Site, Glen Cove, NY (Dvirka and Bartilucci, June 2010). The Site Management Plan (SMP) provides additional background information, site descriptions, redevelopment plans and soil management specifications for each of the Sites.

This RMP will be implemented during a Pre-Construction Remedial Action at the Captain's Cove Site by the Radiological Contractor's Health Physics Field Technician (HPFT) in coordination with the Consultant's Field Engineer. The Radiological Contractor, Safety and Ecology Corporation (SEC) is licensed by the Commonwealth of Kentucky and operating under license reciprocity with New York State Department of Radiological Health (NYSDOH) to provide radiological survey services at the Captain's Cove Site. All parties entering the site, including representatives of the United States Environmental Protection Agency (USEPA), New York State Department of Environmental Conservation (NYSDEC) and or the City of Glen Cove, are required to comply with this RMP. The RMP may be revised based upon radiation levels measured in the field after earthwork or excavation activities have been initiated. Any proposed changes must be reviewed and approved by the Consultant Health Physics Safety Officer (HPSO) (or their designee) and the NYSDEC.

The NYSDEC will be notified at a minimum of 10 days prior to earthwork or excavation activities.

1.1 Purpose and Scope

In accordance with past remedial efforts summarized in the SMP, radioactive soils were previously removed from areas on and/or adjacent to the Captain's Cove Site and the excavations were backfilled with clean soil. The purpose of this RMP is to address radiation monitoring activities to be performed during the Pre-Construction Remedial Action which include excavation, stockpiling, and soil sampling. Specifically, soil disturbed during remedial activities will be monitored for radiation to:

- Segregate soil/waste that may contain radioactive contamination; and
- Protect onsite workers from potential exposure to dangerous levels of radiation.

2.0 RADIATION MONITORING PLAN

The monitoring protocol specified in subsequent sections includes the identification of minimum qualifications for the Contractor's HPFT, selection of appropriate radiation monitoring instruments, instrument calibration, radiation monitoring methodology and establishing background radiation levels at the Captain's Cove Site.

Any radioactive waste identified as a result of monitoring will be segregated and managed by the Contractor as described in the draft SMP.

2.1 Health Physics Field Technician Qualifications

Radiation monitoring will be performed by the Contractor's HPFT. The Contractor's HPFT qualifications will be reviewed by the Consultant. At a minimum, the candidate HPFT will have successfully completed Radiation Worker Training, have 2 years of experience performing field gamma radiation monitoring, have experience with the monitoring instruments specified in Section 2.2 (including routine operation and performing instrument field checks), have demonstrated experience in measuring site background radiation levels and have experience with the collection, handling and shipment of samples for radiological analyses.

2.2 Selection of Radiation Monitoring Instrument

The selection of radiation monitoring equipment was based on the type of radiation in the Li Tungsten mill tailings previously located on and/or adjacent to the Site. The mill tailings, which contained uranium and thorium, were generated during mineral processing of tungsten ores at the Li Tungsten Site. The tailings also contained daughter products, including isotopes of thorium, uranium, radium, and several other products of the natural decay chains.

These radioactive elements produce a mixture of alpha, beta, and gamma radiation. Although alpha and beta radiations are produced by the radionuclides in soil that was present on and/or adjacent to the Sites, these radiations have low penetrating ability, and they are shielded by the first centimeter of soil. This low penetrating ability for alpha and beta cause these radiations to be very difficult to detect by direct measurement. Accordingly, radiation monitoring equipment capable of detecting gamma radiation (a highly penetrating radiation) is specified. For this purpose, a Ludlum™ Model 2221 count-rate meter and scaler (or equivalent) equipped with a Ludlum Model 44-10 2-inch by 2-inch (2 x 2) sodium iodide (NaI) detector for walkover surveys / soil screening.

2.3 Radiation Instrument Calibration and Operation

The radiation rate meter/scaler will be calibrated by the supplier in accordance with the instrument manufacturer's specifications. A source traceable to the National Institute for Standards and Technology (NIST) will be used for calibration. This calibration, in combination with manufacturer developed energy response curves, will be used to characterize instrument response. The response of the meter will be evaluated with a check source daily before and after each survey. Source check results will be recorded in the field log book. All supplier calibration records and source check results will be maintained onsite throughout

the duration of redevelopment activities. During monitoring, the count-rate meter will be operated in the audio mode to aid in detecting radiation count rate changes above 2-times background. The serial numbers and calibration dates will be recorded in the results report.

2.4 Site Background

SEC has performed extensive radiological monitoring of the Captain's Cove Site. As part of their investigations, SEC has developed a gross gamma site background level of 7,500 counts per minute (cpm) as measured with the 2x2 NaI detector, with a screening limit of 15,000 cpm (2-times ambient background).

2.5 Radiological Walkover Survey/Scan

Prior to the excavation activities on the Captain's Cove Site a radiological walkover survey/scan will be completed. The survey will consist of screening of a discrete area centered around the proposed excavation area and will measure twenty feet by twenty feet. The protocol is detailed below.

At each survey location a 100% scan of accessible area will be performed using a Ludlum™ Model 2221 count-rate meter and scaler (or equivalent) equipped with a 2x2 NaI detector. 100% scan is defined as walking at 0.5 meters/second and moving the probe in a serpentine motion. The technician will follow one meter-wide lanes over each entire survey area. In addition, a check of areas with elevated count rates with a collimated 2" x 2" NaI detector may be necessary to locate the source of the high readings, if any. The walkover survey for each survey area will be recorded on a radiological survey form.

2.5 Radiation Monitoring Methodology

The following radiation monitoring protocol was developed to identify radioactive material that may be encountered during the remedial action.

2.5.1 Personal Protective Equipment

Personal protective equipment will include the use of Level D personal protective equipment (PPE) consisting of steel toe boots, hard hats, work clothes, and nitrile gloves. Tyveks will be used if soil is discovered above two times background.

2.5.2 Excavation Screening

At each location a backhoe or equivalent will be utilized to perform excavations. Prior to the excavation, a double layer of 10-mil polyethylene sheeting, sufficiently large to hold the anticipated excavated soil will be laid on the ground in the area where the excavated soil will be placed. Each excavation will be performed in two foot lifts and placed on the polyethylene sheeting in individual piles.

The monitoring protocol described below was designed to effectively detect gamma radiation to a depth of approximately 6 inches below the top of the surface being monitored. Based on this assumption, the monitoring will be performed on two-foot lifts of soil and will result in a monitored volume percent of approximately 25 percent. Screening will be performed using a LudlumTM Model 2221 count-rate meter and scaler (or equivalent) equipped with a 2x2 NaI detector.

Radiation monitoring will entail scanning with the NaI detector across the bucket of the excavator after each two-foot lift of material is excavated. During monitoring, the detector will be held approximately 3 inches or less above the surface being scanned. The detector will be moved over the surface being scanned at a rate not to exceed approximately 0.5 meters per second (m/s). This scan rate will allow the collection of a reasonable number of counts per scan. If a detection greater than two times background is observed, the two-foot lift will be spread into six-inch-deep layers and rescanned. A general description of the material that was scanned (e.g., sand clay, peat, waste, etc.) will also be recorded.

2.5.3 Screening Criteria

For the soil surface or excavation screening using the NaI detector, if count rates exceed 2-times background (as developed in 2.4.1, above), then the provisions specified in the SMP will be implemented. In general, the SMPs require that excavated material that exceeds radiological screening criteria shall be stockpiled separately and the NYSDEC shall be notified. In addition, the excavated material shall be sampled and analyzed in accordance with Section 2.6 below. The location, including global positioning system (GPS) coordinates, of the hot spot and the maximum and minimum count rates observed (rounded to the nearest 100 cpm) will be recorded in the bound field notebook. Hot spot locations will be marked with paint, flags, or other marker.

Radiation levels measured up to two times the Site background is not considered to be a hazard. Radiation measurements in excess of approximately 2-times background will result in controlled disposition of the soil; however, it is not expected to be at a level that will be hazardous to the onsite workers. Note that past surveys of excavations onsite have not detected levels above two times background. As a protective measure against radiation dose to onsite workers, radioactivity above 1 mrem/hr as measured with a calibrated exposure rate instrument such as a Ludlum Model 19 Micro-R Meter or equivalent will be considered a potential radiation worker dose risk. Soil that exhibits readings above background but below the threshold for radiation worker dose risk will be handled as described in the SMP, as there is no significant exposure risk at these levels.

2.6 Soil Sampling and Radiological Analysis

For any soil that is identified as exceeding the criteria of two times the Site background, a minimum of one sample of at least 400 grams shall be taken per stockpile, where the individual stockpile does not exceed 500 cubic yards. Samples shall be analyzed by gamma spectroscopy using Method EML-HASL-300 or equivalent. The spectroscopy should be specified to identify gamma emitting radionuclides associated with the uranium and thorium decay chains. The count times, sample sizes, and geometry should be able to produce Minimum Detectable Concentrations (MDC) of 0.1 picocuries per gram (pCi/g) for Ac-228, Pb-212, Bi-212, Tl-208, Ra-226/U-235, Pb-214, and Bi-214. For U-235, the MDC should be 1 pCi/g or better, and for Pa-234m, the MDC should be 10 pCi/g. Samples to be analyzed for radionuclides shall be dried samples and will be analyzed before activities of the Ra-226 and its daughter products have returned to equilibrium. If there are indications of readings in excavations that exceed the criteria of two times background, then confirmation sampling and analysis will be performed in accordance with NYSDEC guidance in DER-10 (May 2010).

Confirmation samples shall be collected in excavations to document any contamination that remains in place in accordance with the SMPs. Confirmation samples shall be analyzed by gamma spectroscopy using Method EML-HASL-300, or equivalent, to identify gamma emitting radionuclides associated with uranium and thorium decay chains.

APPENDIX E DECONTAMINATION PLAN

P.W. GROSSER CONSULTING, INC.
PROJECT No. RGI1504

DECONTAMINATION PLAN

GARVIES POINT WATERFRONT REVITALIZATION PROJECT
GLEN COVE, NEW YORK

Submitted:
MARCH 2016

PREPARED FOR:
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A, Section C
625 Broadway
Albany, New York 12233

United States Environmental Protection Agency
Region 2
290 Broadway, 20th Floor
New York, New York 10007

ON BEHALF OF:
RXR-Glen Isle Partners, LLC
625 RXR Plaza
Uniondale, New York 11556

PREPARED BY:
P.W. Grosser Consulting, Inc.
630 Johnson Avenue, Suite 7
Bohemia, New York 11716

TABLE OF CONTENTS		PAGE
1.0	INTRODUCTION	1
1.1	Purpose.....	1
1.2	Scope	1
1.3	Application	1
2.0	DECONTAMINATION PROCEDURES	2
2.1	Personnel Decontamination.....	2
2.2	Field Equipment Decontamination	2
2.3	Vehicle Decontamination.....	3

1.0 INTRODUCTION

1.1 Purpose

This document describes general and specific procedures, methods and considerations to be used and observed with regard to decontamination procedures during the course of the remedial action (RA).

The decontamination plan takes into account the specific contaminants inherent to the site and presents the minimum requirements which are to be met by P.W. Grosser Consulting, Inc. (PWGC), its subcontractors, and other on-site personnel in order to prevent the spread of contamination to areas which are free of impact.

Questions or issues concerning site decontamination procedures are to be made directly to the Project Manager or Field Team Leader.

1.2 Scope

This decontamination plan addresses decontamination activities which will be undertaken during the RA activities.

The primary decontamination activities include the following:

- Personnel Decontamination
- Field Equipment Decontamination
- Vehicle Decontamination

1.3 Application

The decontamination plan applies to all personnel involved within the work area, including but not limited to:

- PWGC employees and subcontractors;
- Client representatives; and
- Federal, state or local representatives.

2.0 DECONTAMINATION PROCEDURES

This section specified the decontamination procedures for each of the activities specified in Section 1.2.

2.1 Personnel Decontamination

This section covers the procedures to be followed during the RA to decontaminate personnel who have come in contact with contaminants. Given the nature of the RA, where soil removal will be handled by heavy equipment and human contact with site contaminants will be minimized, it is PWGC's opinion that this procedure may not be required, however, PWGC will include this procedure as a contingency.

This procedure has been prepared based upon field personnel utilizing level C/D (tyvek suit, boots, gloves) personnel protective equipment (PPE).

A personnel decontamination area will be established onsite during site mobilization. The decontamination areas will be established in the transition from the work area to the staging area.

The personnel decontamination area will have large children's wading pools or other vessels for cleaning (as required). Liquid generated during cleaning will be transferred from the cleaning pool to storage drums tank via transfer buckets as needed. Generated liquids will be properly disposed of at the completion of remedial activities. An additional drum will be present to collect impacted single use PPE such as gloves, Tyvek suits, and boot covers.

Personnel decontamination procedures, specifically, will include the following steps:

1. Exit the work area after removing gross contamination and leaving it in contaminated area for later disposal. Enter the decontamination area.
2. Remove protective clothing with the exception of inner latex gloves.
3. Place disposable clothing in waste drum.
4. Remove and dispose of inner gloves and exit decontamination area.

In the unlikely condition that site conditions require the use of non-disposable equipment (level A suit, SCBA, etc) the decontamination plan will be modified as required to include cleaning steps for the reusable equipment.

2.2 Field Equipment Decontamination

This section covers the procedures to be followed concerning decontamination of field equipment. Following use, non-disposable equipment, such as hand tools, shovels, hand augers, and sampling pumps will be properly decontaminated.

The equipment decontamination area will be established adjacent to the personnel decontamination area as all equipment leaving the work area to the support zone are to be decontaminated. In addition, a temporary equipment decontamination area may be established based upon the requirements of the project since sampling equipment may require decontamination between the collection of each sample. The equipment decontamination procedure is to consist of cleaning by brush with a water / detergent solution followed by a potable water rinse. Specialized equipment, such as groundwater sampling pumps, will be decontaminated as per manufacturer recommendations.

Waste water generated during the decontamination process will be collected and stored in drums. Generated liquids will be properly disposed of at the completion of remedial activities. Liquid disposal procedures will be discussed in the construction water management plan.

Expendable equipment (e.g., disposable bailers, twine, etc.) will not be decontaminated but will be drummed as waste.

2.3 Vehicle Decontamination

In order to prevent the spread of contamination by means of vehicles and heavy equipment, the following vehicle decontamination procedure will be followed. This procedure is to be followed for any vehicle leaving the work zone.

The vehicle decontamination procedure will be as follows:

1. Prior to leaving the work area loose soils will be scraped / brushed from the vehicle to the extent possible;
2. An environmentally friendly cleaning agent will be applied to the contaminated parts of the equipment;
3. The equipment will be wiped down with pads; and
4. Once cleaned, the vehicle may proceed off site.